SEPTEMBER, 1953

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

To Change Address
See Bottom of the
Inform-A-Gram Page

THIS COPY
BELONGS
TO

T.P.

Three Reasons Why

1 Reduce set-up and change-over time required on large tapered shank tools.

2 Versatility—drilling, reaming and other operations can be done with same set-up, using Postiv-Lok adapters.

3 Eliminate need of integral tapered shanks. Tools cost less.

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2985 CHARLEVOIX AVENUE • DETROIT 7, MICHIGAN

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RADIUS FORMING TOOLS

"TRU-LINE" PROFILE DRESSING TOOLS

IMPREGNATED DRESSING TOOLS

STANDARD DRESSING TOOLS

"TRU-THREAD" THREAD DRESSING TOOLS

DIAMOND GRIT TOOLS FOR THREAD DRESSING

INDUSTRIAL DIAMONDS

The Charm of Booie, The Witch Doctor

Booie, the Kaffir witch doctor, didn't want to part with the charm. Often he had made big magic with it in his ceremonial dances and without it he might lose face. And, didn't it have miraculous powers?

Schalk van Niekirk, the old Boer trader, thought so—at least it had the power to make him a very wealthy man, for this pebble was four times the size of the one he had sold two years before.

So, all day long they haggled and Schalk brewed pot after pot of Dutch coffee, heavy with sugar, well flavored with a magical potion from a stone bottle and served it with the free hand of a man who feels a fortune tickling his fingertips.

Finally, he stood up, stamped out the fire and said, "Booie, come to my kraal and I will give you 500 sheep, 10 oxen, and a horse— I have nothing more." Booie held out his hand; suddenly, he was incredibly rich.

Schalk sold the big diamond—it weighed 83½ carats—for $56,000, a handsome fortune in 1870. In London, after cutting to 46½ carats, it proved to be of the finest color and brilliance, and the Countess of Dudley gladly paid $125,000 for it. In her tiara it became "The famous Dudley Diamond."

Diamonds are precious in industry, too, because they are still the greatest cutting element known to man. For 43 years we have been importing fine diamonds for our customers. Our field engineers are at your service.

WHEEL TRUEING TOOL COMPANY

18-3200 West Davison Avenue • Detroit 6, Michigan

ESTABLISHED 1910

Offices in Principal U. S. Cities—Agents Throughout the World

WHEEL TRUEING TOOL COMPANY OF NEW JERSEY
33 West Street, Bloomfield, N. J.

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575 Langlois Ave., Windsor, Ont.

Bellows DRILL PRESS FEED

TURNS HAND-FED DRILL PRESSES INTO AUTOMATIC DRILLING MACHINES...

The Bellows Drill Press Feed attaches to the star wheel shaft of any standard drill press. At a touch on the operating handle the Feed advances the spindle rapidly to the work, feeds the drill into the work at an exactly controlled feed rate and thrust; and, when the drilling stroke is completed, automatically returns the spindle to starting position, and stops. Easily accessible controls provide accurate feed rate adjustments for any tool working in any material, at the breakthrough or at any pre-determined point.

The Bellows Drill Press Feed is inexpensive. Prices start at $164.00. It can be transferred from one drill press to another in less than half an hour. It doesn't interfere with hand operation of the drill press. It can be readily synchronized to Bellows work holding and work feeding devices. Relatively unskilled help can do top quality work with it. Frequently a single operator can run as many as three drill presses.

More than 10,000 companies use Bellows Drill Press Feeds. In some plants as many as 400 Feeds are in everyday use—drilling, tapping, reaming, counter boring, threading—building production records that are hard to believe unless you use Bellows Drill Press Feeds yourself.

- **INSTALLS IN LESS THAN HALF AN HOUR**
- **OFTEN DOUBLES, EVEN TRIPLES, PRODUCTION**

WRITE TODAY FOR *Free* BOOKLET

16 pages of facts on how you can use Bellows Drill Press Feeds to cut your drill press costs to a new low.

Address: The Bellows Co., Dept. TP-953 Akron 9, Ohio.

The Bellows Co.

AKRON 9, OHIO

755A

Controlled-Air-Power

FOR FASTER, SAFER, BETTER, AND *LOWER* COST PRODUCTION

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

L & I's broader range of high quality **STANDARD** reamers has met with overwhelming acceptance. Ask your distributor for latest information on L & I's quality plus...

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LAVALLEE & IDE, INC.
CHICOPEE, MASS.

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

formerly
Tool-Die-Machine PROGRESS 1934-1941
TOOL & DIE JOURNAL 1941-51

Vol. XIX—No. 6 September, 1953

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TOOLING and PRODUCTION'S great appeal is to those men who operate the plants and divisions of industry, their production departments and their toolrooms. It is they who collectively are charged with the responsibility of manufacturing their companies' products precisely, efficiently and profitably.

They have the influence that enables them to adopt the ideas and the processes which TOOLING and PRODUCTION describes in every issue AND the authority to recommend, to specify and/or to buy everything that may be needed to reduce costs, increase production or improve quality. These men for whom, each month, our editors seek out or write TOOLING and PRODUCTION'S meticulously accurate stories of "Know-How" and "Tell-How" are T & P's exclusive Cycle of Buying Influence (CBI) in their plants.

Every copy is directed to these men by name, by title and by company address. Please see our CCA verification.

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PUBLISHERS OF
Tooling and Production ★ Die Designing and Estimating ★ Plastics Molds
The Know-How-Library of Tooling and Production

Facts you should know about Kearney & Trecker's Special Machinery Division

If you're a potential buyer of special machines or special tooling – read about our expanded facilities

THOUGH we've been designing and building standard and special machine tools since 1898, limited production facilities for special machines previously prevented us from offering these services on a wide scale.

But now, our Special Machinery Division has new and greatly expanded facilities. Its exclusive job will be to build special machine tools and tooling or specially to adapt standard equipment to solve specific metalworking problems.

Check our qualifications:

EXPERIENCE: We've been in the business 55 years. In addition to being one of the country's leading producers of standard milling machines . . . *our production of special machinery has ranged up to $3,000,000 annually.*

FACILITIES: The new Special Machinery Division plant, built on a 38-acre site, is equipped with more than *$2,500,000 worth of new tools and equipment.*

PERSONNEL: The Special Machinery Division engineering section has nearly 100 experienced design and production engineers at its command. These men specialize in applying to metalworking the latest developments in mechanics, hydraulics, electronics, metallurgy and allied fields. In addition, it has a full complement of experienced machinists and mechanics needed for special machine construction.

PERFORMANCE: Kearney & Trecker's Special Machinery Division is best recommended by its record of successfully solving hundreds of unusual machining problems. These include high production requirements as well as exacting dimensional accuracies and surface finishes.

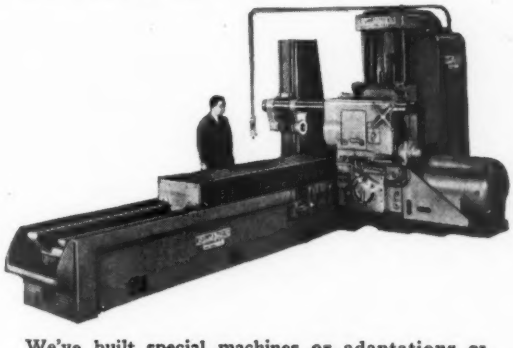
RESPONSIBILITY: Our Special Machinery Division is an integral part of the Kearney & Trecker Corporation . . . and is fully supported by all its financial, physical and personnel resources.

Any commitment for a product of this division is a commitment that fully involves the accepted reputation for responsibility and satisfaction that is Kearney & Trecker's.

We invite your inquiry

We'll be glad to provide you with any information we can . . . including sample machine specification sheets on typical installations, a brochure covering the expanded facilities of our Special Machinery Division, and details on our Customer Engineering Service. Furthermore, if you have special production machinery problems, have one of our senior Project Engineers analyze them, without obligation, of course.

Write, wire or phone the Special Machinery Division, Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



We've built special machines or adaptations of standard equipment for practically every industry. Here is a photo of a 50 hp CSM Simplex milling machine we designed and built for a leading manufacturer.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS ®

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

"CINCINNATI"

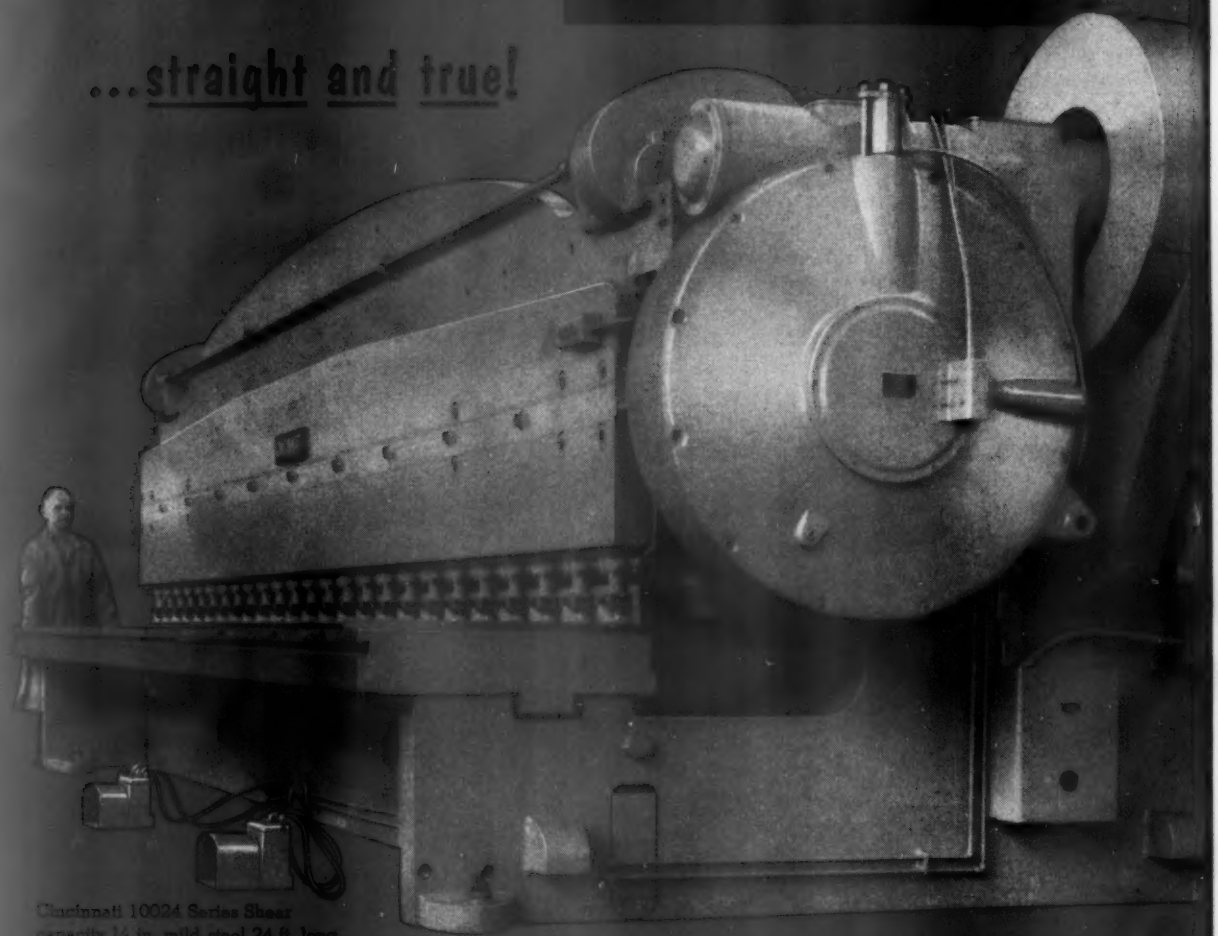
...shears 24 feet of ¼ inch plate

...straight and true!

Cincinnati Shears, built with machine tool accuracy and exceptional rigidity, cut to close tolerances even on the longest cuts.

Built in lengths from 4 ft. to 24 ft., they shear .005" thick sheets to 1¼ in. plate with micrometer accuracy. They handle a wide variety of materials ranging from soft aluminum to armor plate.

Write for complete shear catalog S-6.



Cincinnati 10024 Series Shear capacity ¼ in. mild steel 24 ft. long.

CINCINNATI

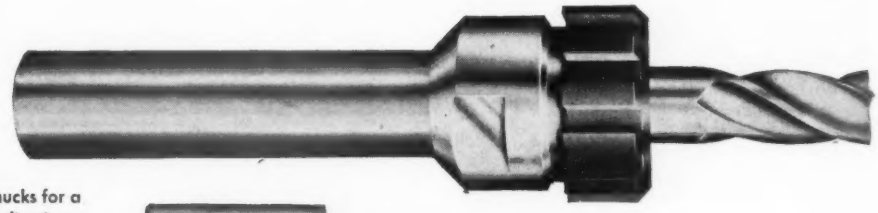
THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

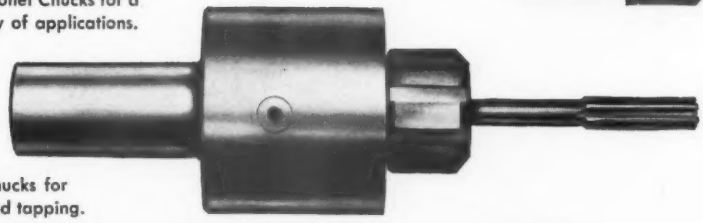
UNIVERSAL CHUCKS

SAVE TIME • SAVE MONEY

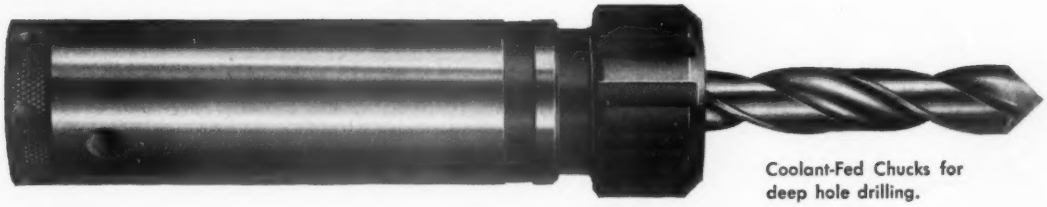
- low first cost, due to simple design.
- wrap-around gripping action eliminates scored tool shanks.
- precision manufacturing assures tools running true.
- sizes from 1/16" to 1½", shanks to fit any type machine.



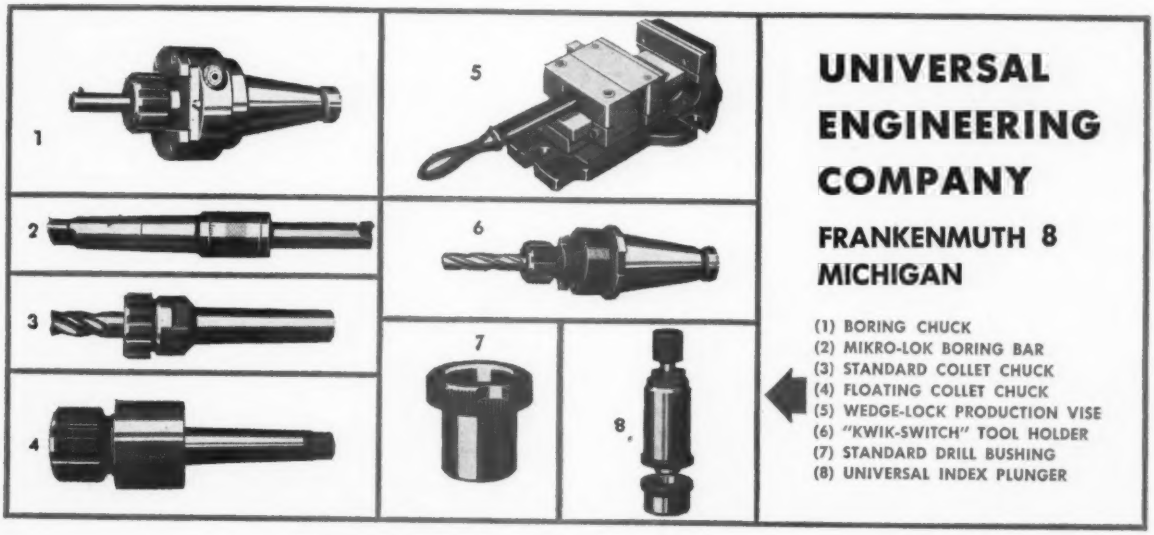
Standard Collet Chucks for a wide variety of applications.



Floating Chucks for reaming and tapping.



Coolant-Fed Chucks for deep hole drilling.



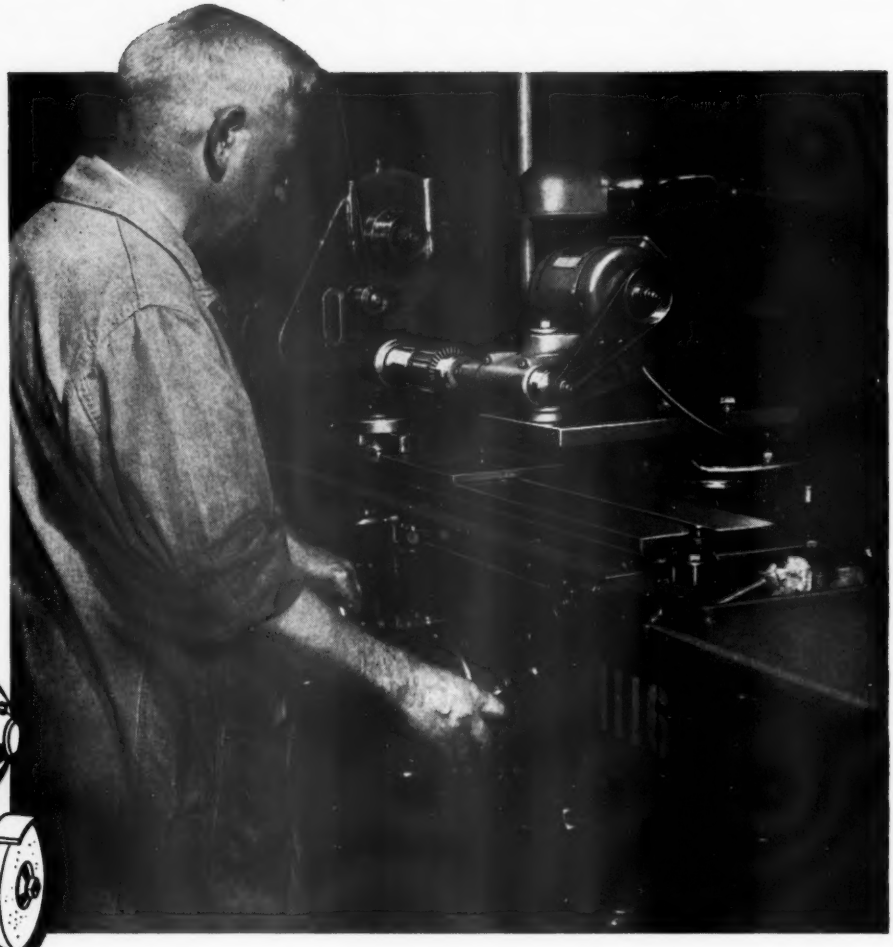
UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 8 MICHIGAN

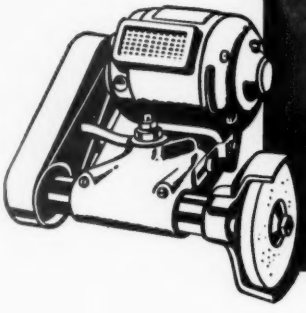
(1) BORING CHUCK
(2) MIKRO-LOK BORING BAR
(3) STANDARD COLLET CHUCK
(4) FLOATING COLLET CHUCK
(5) WEDGE-LOCK PRODUCTION VISE
(6) "KWIK-SWITCH" TOOL HOLDER
(7) STANDARD DRILL BUSHING
(8) UNIVERSAL INDEX PLUNGER

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

26-year record proves DUMORE® GRINDERS give low-cost, accurate service



Mounted on a Universal Grinder, the Dumore operates at a spindle speed of 40,000 rpm. Work speed is 300 rpm.



How DUMORE insures high-speed internal grinding with mirror finish . . . at low cost

MANUFACTURING drill chucks requires a difficult jaw grinding operation. Smooth finish and correct back taper are necessary. And each day, the grinder must stand up under millions of hammer-like blows transmitted by the jaws to the grinding wheel and spindle bearings.

Since 1927, this chuck manufacturer has used DUMORE precision grinders. Here is his report:

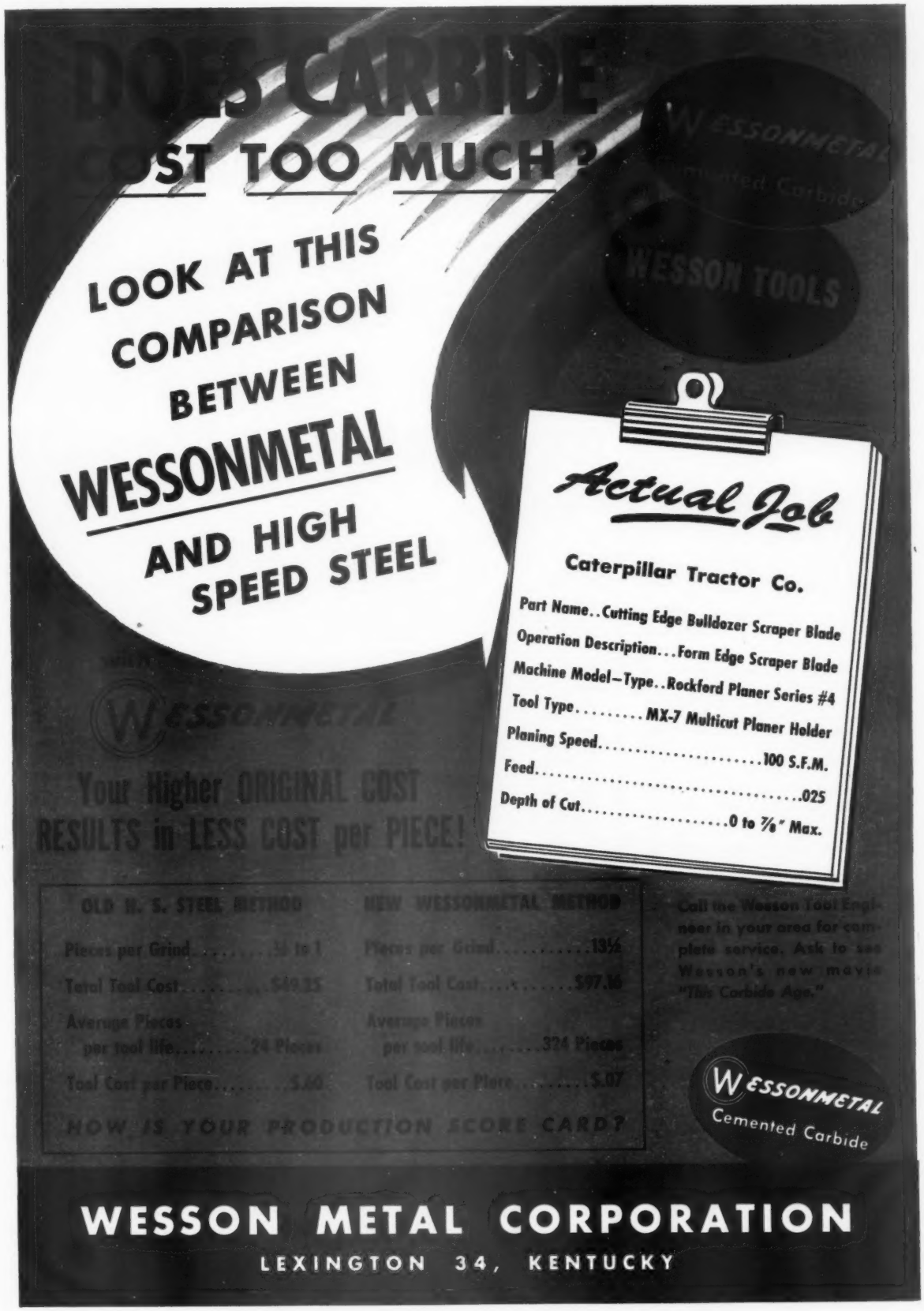
"Our Dumore No. 5 units operate 100 hrs. per week for the internal grinding of 3 open jaws for our ⅛" to 1" plain bearing key type chucks. The material is 60 Rockwell C hardness alloy steel and we remove .005".

"The Dumores are well adapted to this fine work and produce a glass-like finish. Their sturdy power transmission, solid spindle shaft, self-oiling features, air-cooled motor and variable speeds make them exceptionally well suited for this work. They deliver continuous operation with little effort and very low maintenance cost."

If you are seeking a way to improve your internal grinding operations, investigate the advantages Dumore grinders can provide. Get the details from your industrial distributor or write direct:

DUMORE PRECISION TOOLS
The Dumore Company
1313 Seventeenth Street • Racine, Wisconsin

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

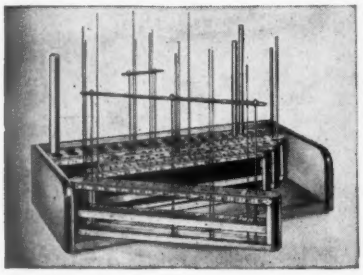

DOES CARBIDE
COST TOO MUCH?
LOOK AT THIS COMPARISON BETWEEN
WESSONMETAL
AND HIGH SPEED STEEL
WESSONMETAL Cemented Carbide
WESSON TOOLS
Actual Job
Caterpillar Tractor Co.
Part Name..Cutting Edge Bulldozer Scraper Blade
Operation Description...Form Edge Scraper Blade
Machine Model—Type..Rockford Planer Series #4
Tool Type.....MX-7 Multicut Planer Holder
Planing Speed.....100 S.F.M.
Feed.....025
Depth of Cut.....0 to 7/8" Max.
Your Higher ORIGINAL COST RESULTS in LESS COST per PIECE!
OLD H. S. STEEL METHOD
NEW WESSONMETAL METHOD
Pieces per Grind.....½ to 1
Pieces per Grind.....13½
Total Tool Cost.....$49.25
Total Tool Cost.....$97.16
Average Pieces per tool life.....24 Pieces
Average Pieces per tool life.....324 Pieces
Tool Cost per Piece.....$.60
Tool Cost per Piece.....$.07
HOW IS YOUR PRODUCTION SCORE CARD?
Call the Wesson Tool Engineer in your area for complete service. Ask to see Wesson's new movie "This Carbide Age."
WESSONMETAL Cemented Carbide
WESSON METAL CORPORATION
LEXINGTON 34, KENTUCKY

inexpensive

. . . Money Saving Accessories For Your Plant

Each of the accessories illustrated and described below was designed and built for a definite need and used in our own plant before being offered to industry. They require a relatively small investment, yet will save you money every day. For further information, write for the folder offered below.

DRILL ROD RACK

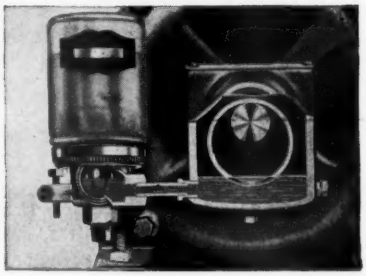


Eliminate trouble and waste effort with this modern method of storing drill rod. Put the Acro rack in a central location of each department and make it simple for each mechanic to select correct rod size in a hurry. It also provides a visual inventory for checking rod replacements.
Accommodates 26 letter sizes, 52 pieces; 47 fractional sizes, 138 pieces; 60 number sizes, 304 pieces. Fractional sizes graduated in 64ths from 1/32" to ½" and in 32nds from ½" to 1" included.

LEADER PIN OILERS

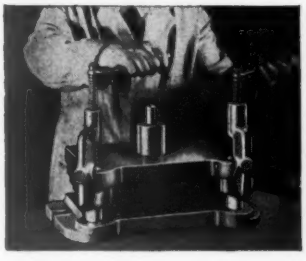
Eliminate wear on your die sets with these leader pin oilers. Acro Pin Oilers, as illustrated, fit over each leader pin and seals in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Eliminate bushing wear, leader pin scoring, and maintains die accuracy. Die sets equipped with Acro Pin Oilers have run under tests for several weeks to a month without refilling.

AUTOMATIC LUBRICATORS



With this Acro lubricator, you can lubricate oil ring, capillary, ball or roller bearings on electric motors, blowers, lineshafts and similar bearings for periods as long as six months to one year with one filling. You can save 50 to 95 per cent in oil consumption, practically eliminate maintenance labor and burned out bearings due to faulty hand oiling and guesswork. In addition to savings effected in labor and maintenance, Acro lubricators soon pay for themselves in oil savings alone.

DIE SET PULLERS



The principle of the Acro Die Set Puller is to remove the punch holder from the die shoe by a straight upward pull, whereby punch holder travels upward from die shoe axially, leaving both leader pins simultaneously. This is accomplished only by use of the indexed screw wrenches which act as indicators, controlling the upward travel. This is an exclusive patented Acro feature, found only in Acro Die Set Pullers.

Free Data

covering each of these profitable accessories is included in our folder. Write for bulletin TP-52.

ACRO

METAL STAMPING CO.

330 EAST RESERVOIR AVE.

MILWAUKEE 12, WIS.

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we are expanding our facilities to bring you...

more "Desegatized"® steel—faster!

In order to improve our service to tool steel users, we have expanded our warehousing facilities since October, 1950, by erecting a new warehouse at Los Angeles to serve the West Coast . . . moving from downtown Chicago to a new, larger warehouse in suburban Melrose Park, Illinois . . . replacing our Detroit warehouse with improved location and facilities at Centerline, Michigan . . . adding to warehouse at Hartford to nearly double its capacity . . . enlarging warehouse and shipping facilities at Latrobe.

and now—we are moving our New York district sales office to a new office and warehouse at Hillside, New Jersey. Just south of Newark, this location is ideally suited to serve our many customers in northern New Jersey, greater New York and the Hudson River valley.

A growing fleet of Company-operated trucks brings plants east of the Mississippi River within a one or two day delivery cycle from our warehouses or our manufacturing facilities at Latrobe, Pennsylvania.

LATROBE STEEL COMPANY

LATROBE, PENNSYLVANIA

SOLE PRODUCERS OF "DESEGATIZED" STEELS

BRANCH OFFICES AND WAREHOUSES

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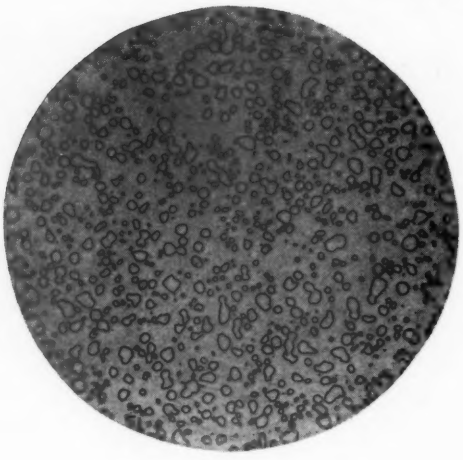
EUROPEAN OFFICES IN

GENEVA PARIS BRUSSELS ROTTERDAM MILAN



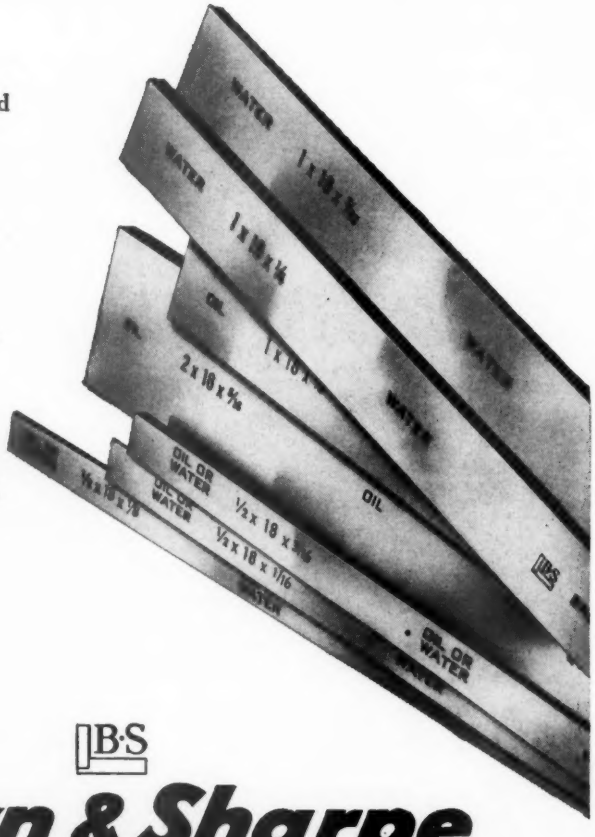
Actual photomicrograph shows desirable spheroidized structure of Brown & Sharpe Ground Flat Stock . . . the result of specially controlled annealing for better machining and hardening.

Special Annealing Makes Brown & Sharpe Ground Flat Stock

Easier to Machine... Easier to Harden

The annealing of all Brown & Sharpe Ground Flat Stock is carefully controlled to obtain the spheroidized structure shown above. This means that in addition to the time-saving advantage of using ground flat stock, you get improved machineability—smoother finish and longer tool life—by specifying Brown & Sharpe. And when hardening, you are assured of high uniform hardness with little distortion.

Other advantages of this accurately ground, first-quality tool steel include continuous repeat markings on the stock and convenient packaging. Each piece of stock is marked along its entire length . . . always identifiable, even when partially used. Individual color-coded envelopes protect each piece and give you complete heat treating instructions. At a glance, the color identifies the stock as "oil or water" hardening, "oil" hardening, or "water" hardening. All three types available in wide range of sizes. Write for complete information. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



BUY THROUGH YOUR LOCAL DISTRIBUTOR

B·S

Brown & Sharpe

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

A SPINDLE YOU CAN *Specify* WITH CONFIDENCE

THE POPE PRECISION SPINDLE

1 HP, 3600 RPM MOTORIZED

with Super Precision Roller Bearings and Separate Thrust Bearings

The picture shows you why this Spindle has swept the field for 6" x 18" surface grinder application (producing finer finishes at lower cost)—and why it has been promptly drafted for hundreds of other jobs.

There are many types of bearings but none can approach the superb combination of ruggedness and precision found in the double row cylindrical roller bearings you see in this Spindle. They have tremendous load carrying capacity, produce a superior finish and assure long, trouble-free operation.

Note the thrust bearings. There is no endwise movement of the shaft in either direction.

Spindles have the Pope System of lubrication and are dynamically balanced in full assembly.

Applicable to all new grinders and to those now in service. Write for price and delivery.

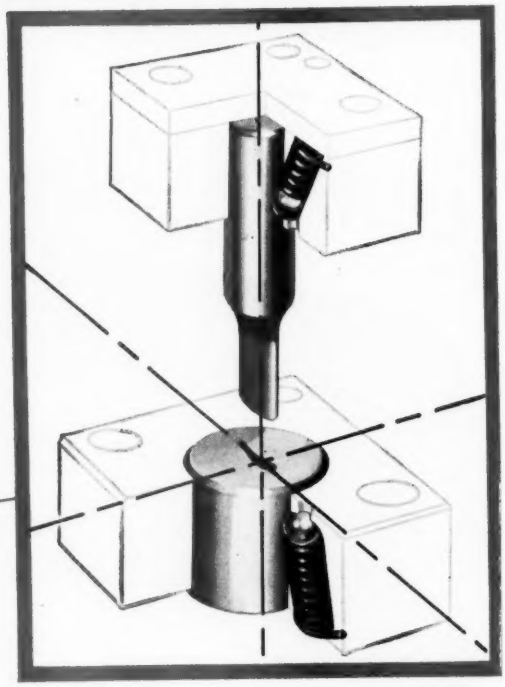
No. 95

Specify POPE PRECISION SPINDLES

POPE MACHINERY CORPORATION
Established 1920
261 RIVER STREET • HAVERHILL, MASSACHUSETTS

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

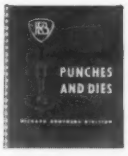
WHY R-B Punches are easier to use



Just a push, a twist, and "click" your R-B punch or die button is accurately ALIGNED and LOCKED in place. The R-B ball lock prevents radial or vertical movement of the punch or die button in the retainer—no additional keying is required.

R-B punches and die buttons are just as easy to remove—simply insert tanged tool in retainer hole to release ball lock. Standardized and completely interchangeable in any shape or size, these easy to use punches and die buttons save your time and energy.

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 74 • 12635 BURT RD. • DETROIT 23, MICHIGAN



Please send me additional information.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

Also Produced in
OTHER ALLIED PLANTS
SPECIAL COLD FORGED PARTS
STANDARD CAP SCREWS
PRECISION GROUND PARTS
SHEET METAL DIES MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

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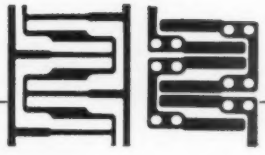
THE TREND IS TO MORE STAMPINGS WITH BLISS PRESSES

Bliss High Production Press, No. 630, one of six at Western Electric's Kearny Works.

At *Western Electric* Bliss Presses Produce Switchboard Stampings at 300 spm

For *really* high-volume production of precision stampings for telephone switchboards, Western Electric Company uses six Bliss High Production Presses at its Kearny (N. J.) Works. Equipped with precision roll feed and scrap shear, the Bliss units operate at speeds up to 300 spm and hold tolerances within .002" in progressive dies. And set-up time for die changeover in these Bliss automatic presses averages *only 30 minutes.*

Bliss High Production Presses are ideal for high-speed, short-stroke production and for progressive die work. This type of press was introduced by Bliss more than 20 years ago in keeping with its continuing policy of providing "the right press for a given job." Whether your job is stamping, drawing, forming or squeezing, it's wise to investigate Bliss *first.*



FOR EXAMPLE:

Hinge Spring (above)
.008" nickel silver; No. 630 Bliss press; progressive tool and automatic feed plus pilots; 125 spm; two parts per stroke, 9,000 parts per hour; 2,850,000 parts per year.

Contact Spring
.0225" nickel silver; No. 620 Bliss High Production Press; compound tool and automatic feed; 300 spm; 12,500 parts per hour; 1,200,000 parts per year.

Clamping Plate
.032" steel; No. 650 Bliss press; progressive tool and automatic feed plus pilots; 180 spm; five parts per stroke; 41,400 parts per hour and 5,700,000 parts per year.

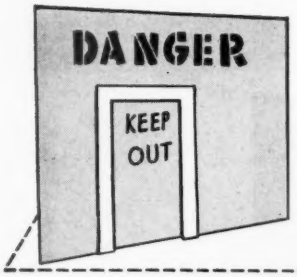
Contact Spring
.0131" nickel silver; No. 630 Bliss press; compound tool and automatic feed; 300 spm; 13,500 parts per hour; 6,850,000 parts per year.

E. W. BLISS COMPANY, CANTON, OHIO
E. W. Bliss (England) Ltd., Derby, England
E. W. Bliss Company (Paris), St. Ouen sur Seine, France
PRESSES, ROLLING MILLS, SPECIAL MACHINERY

Branch offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. West Coast Representatives: Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Company, Seattle. Other dealers in United States cities and throughout the world.

BLISS

ON YOUR PRESS IS MORE THAN A NAME...IT'S A GUARANTEE!



BARTH-BUILT

SYNCRO UNITS MEASURE "TRAVEL"

by Remote Control!

Wiring, harness, tubing, etc., ready for complete assembly

Saddles in which the complete Syncro Units are assembled

WHERE DEADLY FUMES, noxious gases, powerful rays, explosives, corrosives, etc., make remote control imperative to the safety of technicians or operators, why not call in a Barth engineer?

Herewith are shown in process of production, 250 highly intricate Syncro Units being completely built and assembled at the Barth Plant . . . these units accurately measure by remote control the amount of "travel or distance travelled".

Barth has the engineers, designers and manufacturing facilities to produce remote control equipment that will help you maintain production at high levels without endangering lives.

BARTH STAMPING & MACHINE WORKS Inc.

12650 Brookpark Road, Cleveland 29, Ohio

DESIGNERS AND BUILDERS OF DIES, TOOLS AND SPECIAL MACHINERY

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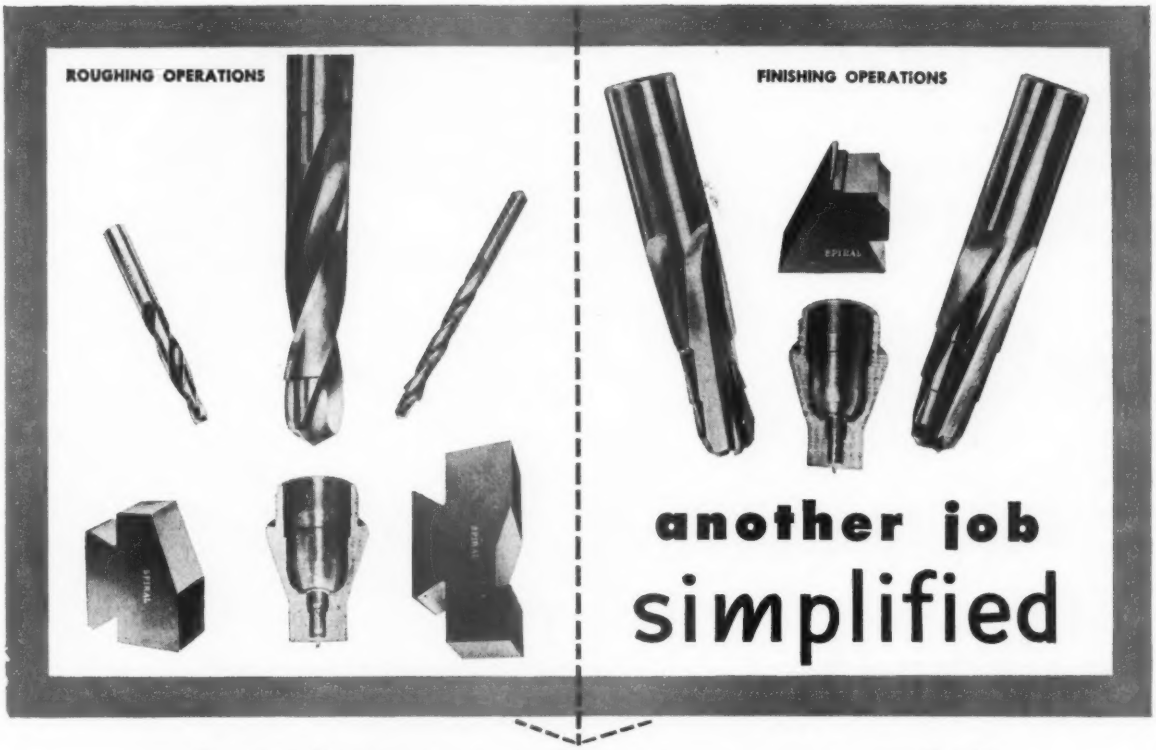


at a lower piece cost with

SPIRAL

special cutting tools

HIGH SPEED OR CARBIDE

Tough cutting problems are simplified with Spiral special tools. The solution illustrated here is another example of how Spiral provides maximum tolerance control and longer tool life, while increasing production, with special tools fitted to the job.

FREE TOOL ENGINEERING HELP

For a quick answer to your specific cutting tool problems, send complete details, including tool, part print and specifications. Write for a free copy of latest bulletin showing other examples of SPIRAL time saving tools.

CARBIDE FORM TOOLS

Working from your tool or part prints, SPIRAL will design and build single or multiple insert circular or dovetail form tools for any of your carbide form tool requirements.

SPIRAL STEP TOOL COMPANY

Dept. T • 5400 NORTH DAMEN AVENUE • CHICAGO 25, ILLINOIS
PHONE: LOngbeach 1-5384

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

Look here

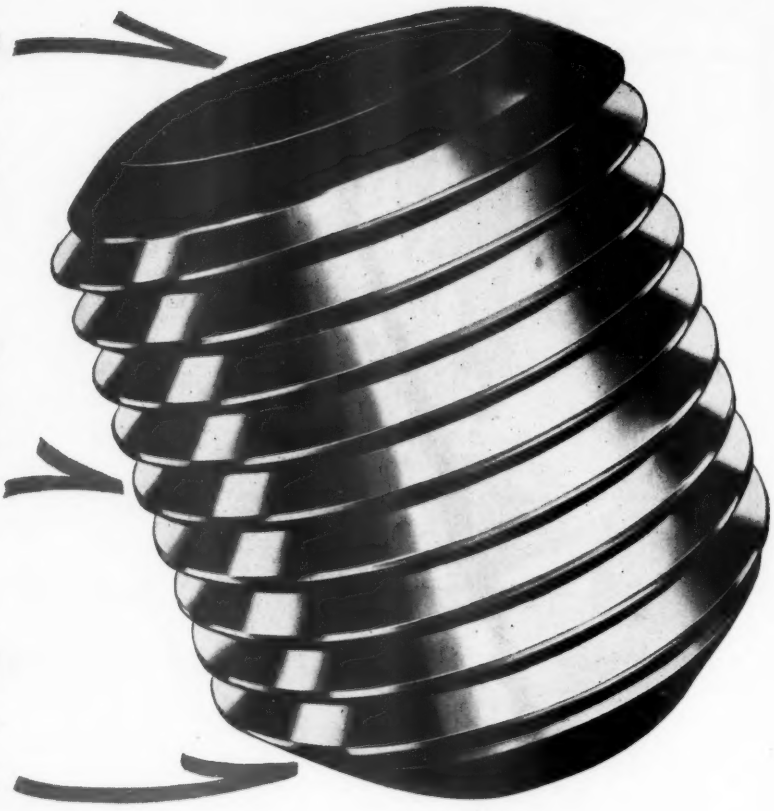
and see why the P-K Hex is the Standard for accuracy. It's true-centered, true to size, right depth for easy keying!*

Look here

for P-K *Ground Threads*, the smoothest, brightest, gage-like threads you've ever seen on a Socket Set Screw!*

Look here

for clean, burr-free starting threads, another advantage of P-K thread-grinding that means faster assembly!*



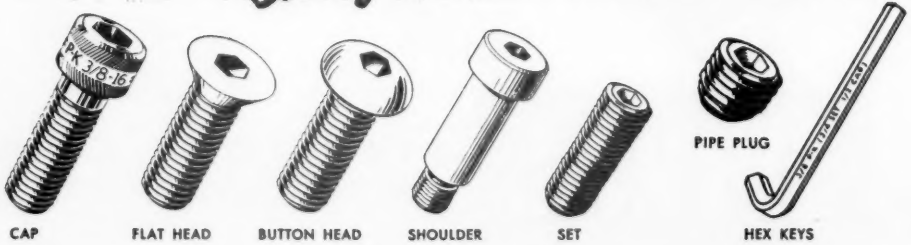
* You'll have to *look beyond* even the best picture to see the super-smooth, gleaming finish, the years-ahead quality of P-K Ground Thread Socket Set Screws. But you'll agree when you see the actual screws.

So get SAMPLES . . . and compare. Ask your P-K Distributor, or write Parker-Kalon Corporation, 200 Varick St., New York 14.

The INDUSTRIAL DISTRIBUTOR steers your Supply Dollars to the best values.

PARKER-KALON®

Cold-forged **SOCKET SCREWS**



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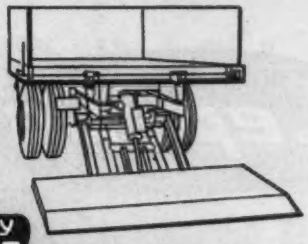
Checking the dies in a DANLY SPECIAL DIE SET—all steel, 4-post type, 26" x 35".



ANTHONY LIFT GATE HYDRAULIC

SHOWN IN LOADING POSITION

DANLY SPECIAL DIE SETS

View showing DANLY SPECIAL DIE SET during production run. Tail gate gussets are blanked and pierced in a single stage operation from 10 gage blue annealed sheet.

DANLY®

DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS SUPPLIES

help Anthony give industry a lift!

For years now, the Anthony Company, makers of hydraulic lift gates for motor trucks, has relied on Danly Special Die Sets in their production operation. Based on long experience, they've found that Danly Special Die Sets cut their tooling costs and save time . . . because they provide the finest precision starting point for diemaking. Why not build your production dies in Danly Special Die Sets? . . . see what die performance can really mean.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

DANLY SPECIAL DIE SET SERVICE IS FAST AND CONVENIENT—CALL YOUR NEAREST DANLY BRANCH

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***DAYTON** 7	3196 Delphos Avenue
***DETROIT** 16	1549 Temple Avenue
***GRAND RAPIDS**	113 Michigan Street N.W.
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***LONG ISLAND CITY** 1	47-28 37th Street
***LOS ANGELES** 54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2	111 East Wisconsin Avenue
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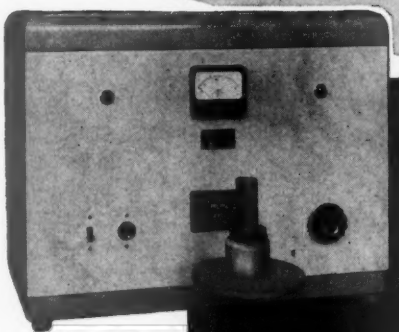
*Indicates complete stock

Lepel's 3 new

LOW COST - PORTABLE HIGH FREQUENCY *Induction* HEATING UNITS



MODEL 2 KW Spark Gap Operated
$870.
f.o.b. factory

MODEL T-2½-I Electronic Tube Operated
$1620.
f.o.b. factory

Ideal for

- Production Heating of small parts
- Research Laboratories
- Tool Rooms
- Machine Shops
- Educational Institutions

MODEL T-I Electronic Tube Operated
$885.
f.o.b. factory

The Lepel line of induction heating units represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating. With a background of half a century of pioneering electrical and metallurgical experience, the name Lepel has become the symbol of induction heating equipment embodying the highest standards of engineering achievement, dependable low cost operation and safety.

Amazing in its speed, Lepel equipment reduces the time required for hardening, annealing, stress relieving, brazing, soldering and melting from minutes to seconds. It performs these operations with a degree of precision and uniformity rarely attained through other processes.

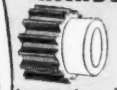
LEPEL Electronic Tube GENERATORS available from 1 kw to 100 kw.
LEPEL Spark Gap CONVERTERS available from 2 kw to 30 kw.

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information on high frequency induction heating.

BRAZING

Permits widest choice of silver or copper brazing alloys from lowest to highest melting points. Ideal for brazing carbide tips.

HARDENING



Heat localized exactly where wanted at desired temperature. Ideal for gears, cams, bearing surfaces, cutting tools and other areas that are subject to wear.

SOLDERING

Speedily and neatly performs intricate soldering applications with or without the use of preformed rings.

ANNEALING

Ideal for annealing, stress-relieving, normalizing or pre-heating selected areas.

MELTING

Readily melts quantities of ferrous and non-ferrous metals in either graphite or ceramic crucibles.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

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55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

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K. O. Lee Introduces Hydraulic Grinder

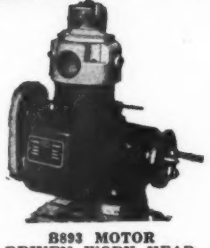
New! MODEL BA860H UNIVERSAL GRINDER

Hydraulic Power Unit For Table Traverse Now Available On All BA800 Series K. O. Lee Grinders

Features . . .

- Pressurized oil flow to traverse table ways. Oil flow is adjustable by needle valve.
- Manual control for variable table speeds.
- Adjustable control for dwell desired.
- Hydraulic power unit can be quickly disengaged so grinder can be manually operated.
- Fully universal. (Model BA860H)
- All controls conveniently located on front position of machine.
- Rigid construction throughout with modern lines and machine finish.
- Capacities to serve practically all surfacing, internal, external, and general grinding operations.

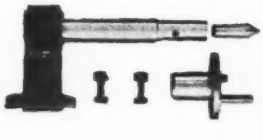
Write for Free Catalog illustrating the many workholding accessory attachments available and adaptable to all grinders.



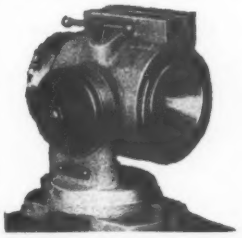
B893 MOTOR DRIVEN WORK HEAD
No. 11 B & S Taper in Spindle

B885 RADIAL GRINDING FIXTURE
No. 11 B & S Taper in Spindle

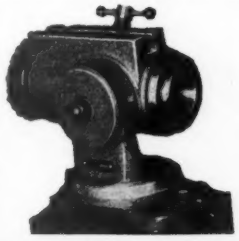
Manufacturers of World's Most Popular Grinders and the Largest Selection of Workholding Fixtures for Grinders



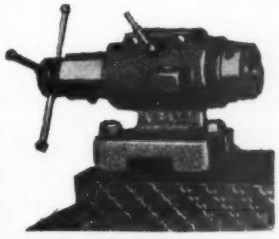
B895
DEAD CENTER FIXTURE



B892 SENSITIVE WORK HEAD
No. 50 MM Taper in Spindle



B842 SENSITIVE WORK HEAD
No. 11 B & S Taper in Spindle



B647 TAP GRINDING FIXTURE

K. O. LEE COMPANY, ABERDEEN, SO. DAKOTA

We invite you to inspect this new hydraulic grinder at our booth No. 2441 at the National Metal Congress in Cleveland October 19-23.

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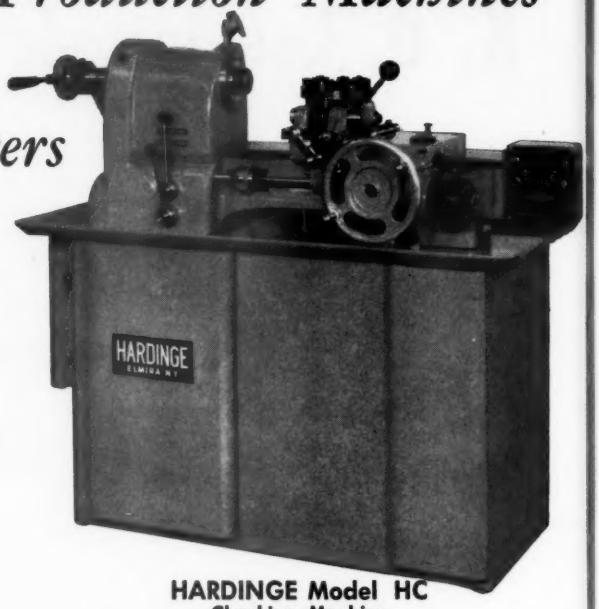
HARDINGE
ELMIRA, N.Y.

Precision Production Machines for Aircraft Manufacturers

THERE is a widespread general acceptance of these machines as being capable of meeting the extreme accuracy requirements of the aircraft industry. They combine high speed, accuracy, ease of operation, and low initial cost. This means tool room accuracy, better part finish and low cost production. These fast-action machines are cutting costs on jobs which were usually allotted to large, slow and expensive machines.



HARDINGE Model HC
Chucking Machine
Collet capacity 1", Chucking capacity 6", Swing 13"

HARDINGE Model DSM 59
Second Operation Machine
Collet capacity 1", Chuck capacity 6"

The Hardinge Second Operation Machine is a time-tried production machine, easy to set up and relatively inexperienced operators can turn out parts rapidly to close tolerances and fine finish.

The extreme accuracy and high speed of this machine enable you to chuck partially finished parts and to rapidly do close tolerance turning, forming, boring, drilling, threading and facing.

HARDINGE Model HCT
Chucking Machine with Production Threading Head
Collet capacity 1", Chucking capacity 6", Swing 10", Internal and External Threading up to 6"

Hardinge Precision Chucking Machines can finish diameters, shoulders, end faces and cut precision threads in *one setting—all concentric* with each other.

Everyone responsible for the machining of precision parts appreciates the value of machines which can be quickly and inexpensively tooled. These Hardinge machines can be tooled with standard tool bits for fast production of precision parts.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

INTRODUCING

CADDY® TOGGLE CLAMPS

EXTRA LARGE PIVOT PINS

Up to 3 times more bearing surface than other clamps. In actual test under load, V-3 clamp withstood 250,000 cycles without excessive wear.

ALL WELDED CONSTRUCTION

Will not come apart even after pins become excessively worn.

For complete information Bulletin TC-6 on request

DOUBLE CLAMPING PRESSURE

Design of linkage provides double the clamping pressure of competitive clamps at the same pressure on the handle.

HEAVIER LINKS AND HANDLE

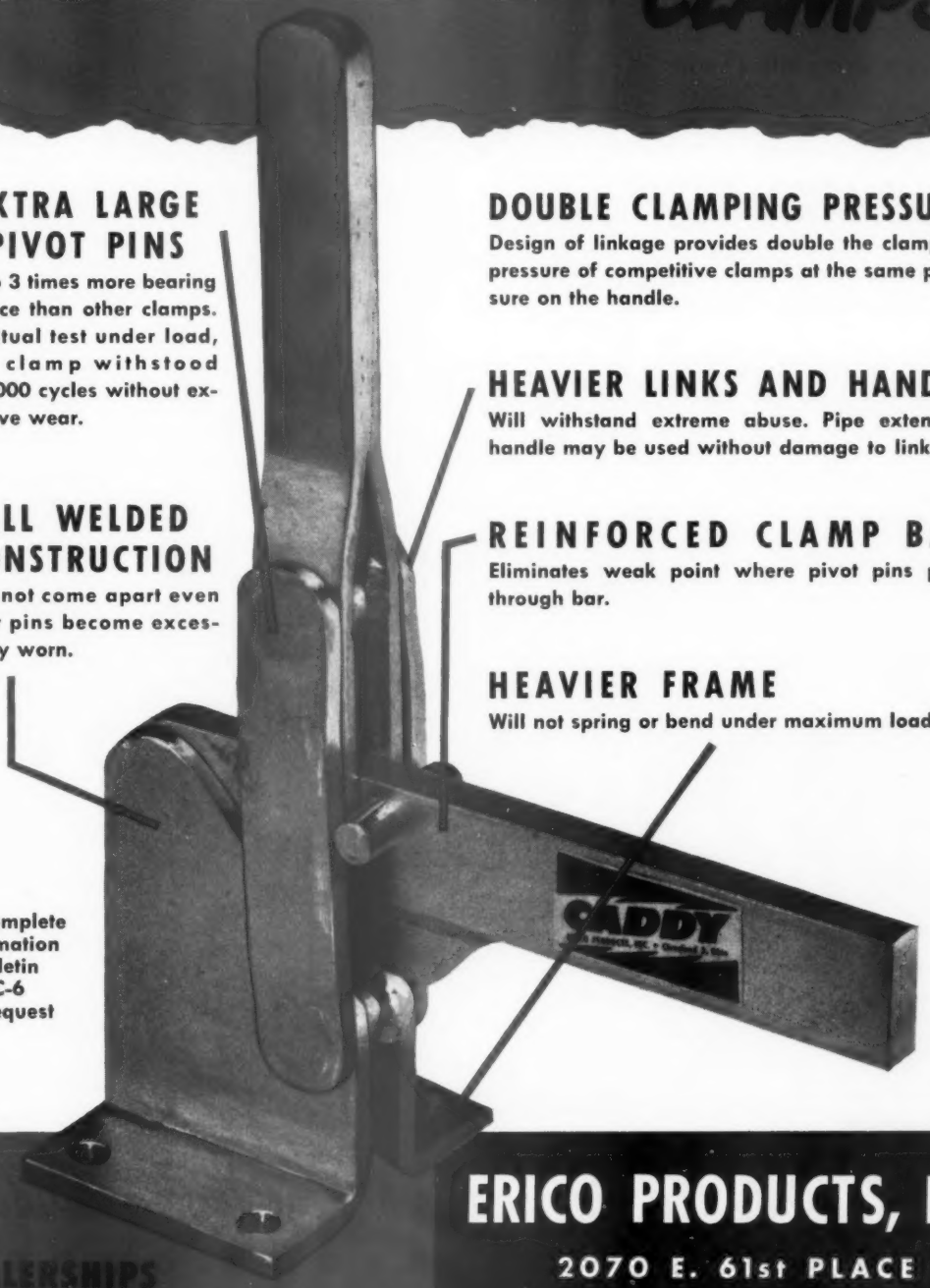
Will withstand extreme abuse. Pipe extension handle may be used without damage to linkage.

REINFORCED CLAMP BAR

Eliminates weak point where pivot pins pass through bar.

HEAVIER FRAME

Will not spring or bend under maximum load.



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ERICO PRODUCTS, Inc.

2070 E. 61st PLACE

CLEVELAND 3, OHIO

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Hundreds of hours longer...

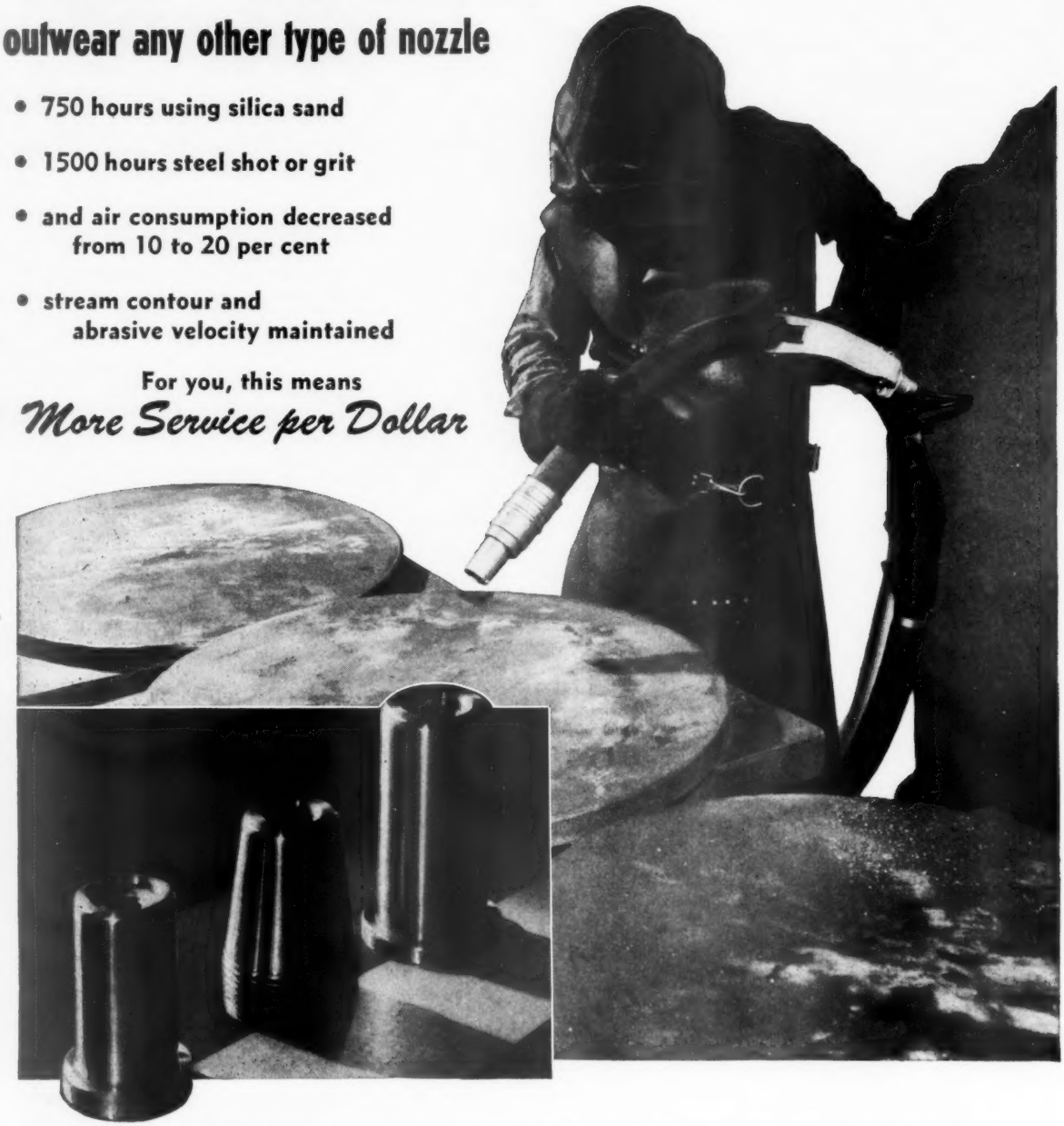
NORBIDE® Pressure Blast Nozzles

outwear any other type of nozzle

- 750 hours using silica sand
- 1500 hours steel shot or grit
- and air consumption decreased from 10 to 20 per cent
- stream contour and abrasive velocity maintained

For you, this means

More Service per Dollar



Only the diamond is harder than Norbide

NORTON® NORTON COMPANY
WORCESTER 6, MASSACHUSETTS

Making better products to make other products better

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Only SUPERIOR

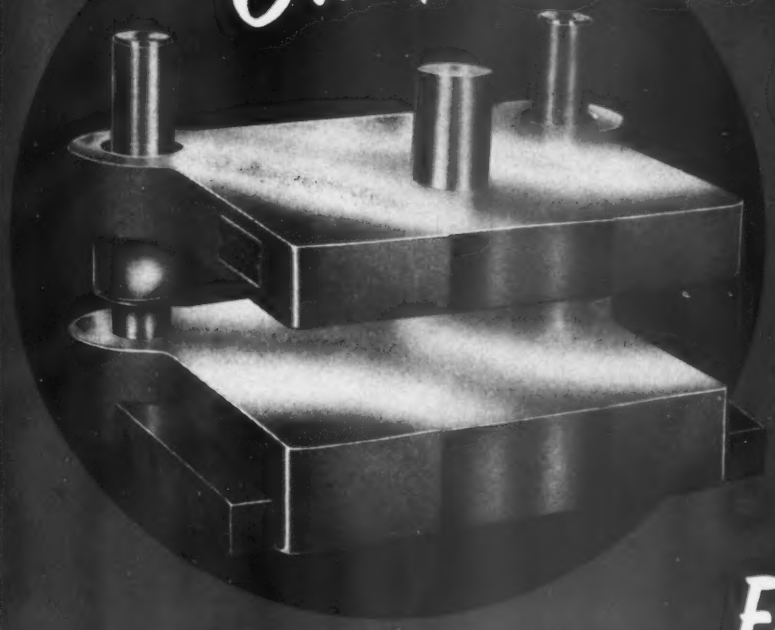
PRECISION—ALL STEEL

DIE SETS

Give You These

3 Features

For Safer Faster Handling



1 SAFETY FLANGE

protects fingers by providing roomy gripping space on either side of the die shoe. This flange may be mounted flush or on the edge of the die set and is welded in place. *There is no extra charge for this valuable safety feature.*

2 LOCK JAW LIFTING DEVICE

removes the danger of handling large die sets. Heavy steel components of this device are welded in place forming an integral part of the die set. They are positioned to insure proper balance when the set is lifted by either chain fall or crane.

3 E-Z LIFT SLING CHAIN

is especially designed to fit the safety flanges of the die sets. Male jaws attached to the sling fit quickly into place for immediate lifting. There is no need for screw clamps, eye bolts, or lifting lugs. Nor is there danger of distorting stresses being set up in the die or set because of improper lifting.

It's no longer necessary to take needless risks in handling die sets. Risks that might easily injure the hands of skilled die makers, ruin costly dies in process or completed, or even damage press equipment. Safety features of Superior die sets have eliminated all of these dangers and have speeded up the overall handling of sets from the bench to the press. Prove to yourself the merits of these safety features in both small and large die sets.

FREE CATALOG—*Write today for this helpful data on Superior die sets and die makers' supplies.*

For Fast Local Service Call these Expert Superior Representatives

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- Indianapolis, Ind.—BRoadway 5668
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- Dallas, Tex.—Riverside 5138
- Syracuse, N. Y.—2013 James St.
- Rockford, Ill.—Phone 3-3991
- St. Louis, Mo.—Lucas 1223
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30 YEARS OF QUALITY-SERVICE

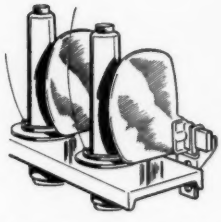
SUPERIOR STEEL PRODUCTS CORP.
2754 S. 19th ST., MILWAUKEE, WIS.

UNBRAKO BUTTON HEAD SOCKET SCREWS feature the following: threads to head; low head height; nonslip internal wrenching; hex socket that minimizes possibility of marred or mutilated heads; fully formed threads—Class 3 fit; heat treated alloy steel; standard sizes from # 8 through 5/8" diameter.

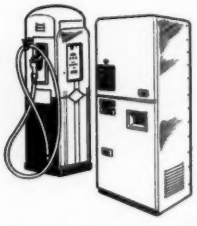
Our Fiftieth Year

A START FOR THE FUTURE

USE UNBRAKO BUTTON HEAD SCREWS on transportation equipment—door and window frames, paneling, seats.



On textile machinery—slashers, twisters, bobbin shields.



On sheet metal assemblies—beverage coolers, gasoline pumps.

Have you checked our UNBRAKO standards?

We suggest you do, because a standard UNBRAKO delivered from your distributor's stock means faster and better service. A standard will do the job as well as a special at much lower cost. For details about UNBRAKO Standards, write SPS, Jenkintown 36, Pa.

Write for UNBRAKO Standards

UNBRAKO® SOCKET SCREW DIVISION

SPS JENKINTOWN PENNSYLVANIA

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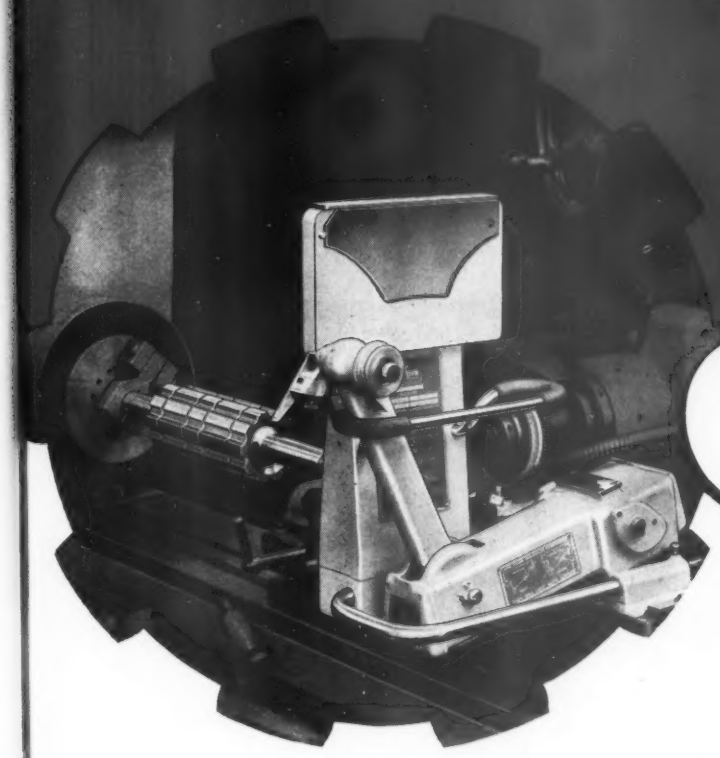
NOW GRIND STRAIGHT and INVOLUTE SPLINES

Easily . . . Accurately

with



Diaform WHEEL FORMING ATTACHMENT

Applied to CONVENTIONAL SPLINE SHAFT GRINDING MACHINES

The Pratt & Whitney DIAFORM Wheel Forming Attachment operates on the pantograph principle and provides a size reduction ratio of 10 to 1 between the template and the grinding wheel. This means a correspondingly favorable ratio in the reduction of errors in form grinding spline shafts, punches, dies, forming tools and other similar work pieces. Newly adapted to use with conventional spline shaft grinding machines, the DIAFORM now — for the first time — makes possible fast, easy, profitable production in accordance with American Standard, B5.15 on Involute Splines approved and published in 1950.

A lightweight, portable instrument, the DIAFORM does not interfere with normal grinding operations when left on the machine. Forming and re-truing wheels is accomplished by lightly traversing the tracer over an inexpensive template; even the most complicated forms are easily completed in a much shorter time than by any other method. Like all Pratt & Whitney products, the DIAFORM is manufactured and inspected to conform with rigidly high standards of quality and accuracy.

SEND NOW FOR COMPLETE INFORMATION

Learn how DIAFORMING can bring new standards of accuracy . . . and new savings . . . to your grinding operations. Just fill in and mail the attached coupon or write on your Company letterhead.

DO IT NOW

PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U.S.A.

BRANCHES IN PRINCIPAL CITIES

First Choice for Accuracy

MACHINE TOOLS • CUTTING TOOLS • GAGES

PRATT & WHITNEY — Div. Niles-Bement-Pond Co.
15 Charter Oak Blvd., West Hartford 1, Conn.

Gentlemen: Please mail my copy of:

- ☐ BULLETIN NO. 543 for WHEELS UP TO 1" WIDTH — 10" DIAMETER
- ☐ BULLETIN NO. 548 for WHEELS UP TO 3" WIDTH — 20" DIAMETER

NAME _____

POSITION _____

COMPANY _____

CO. ADDRESS _____

CITY _____ ZONE ____ STATE _____

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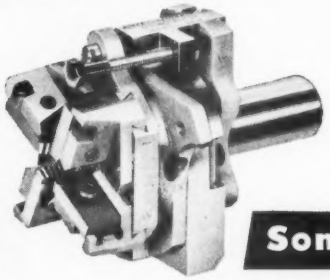

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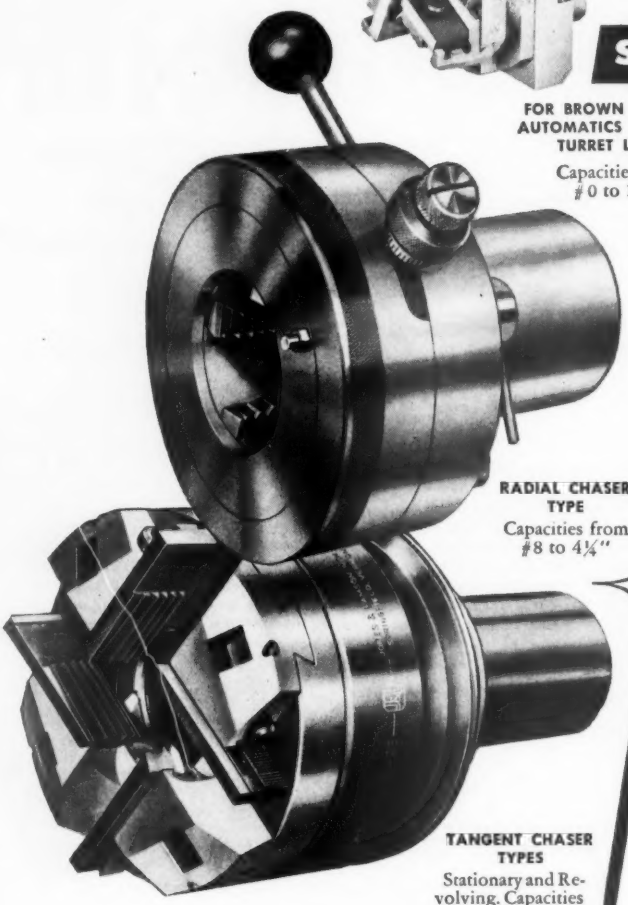

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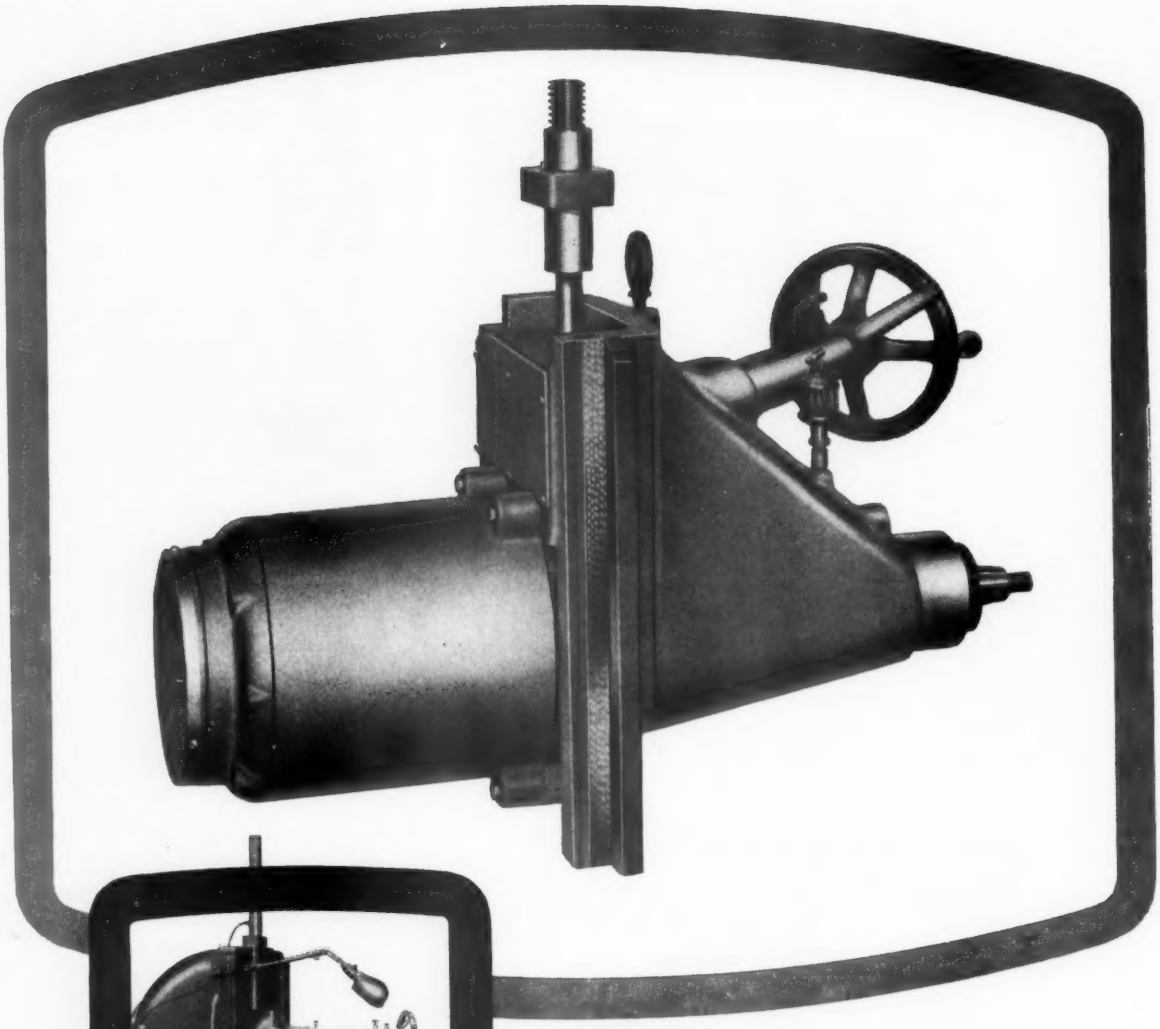

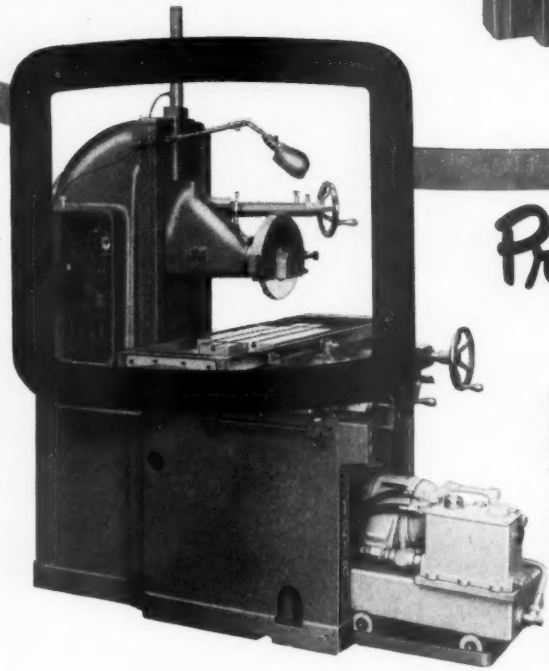

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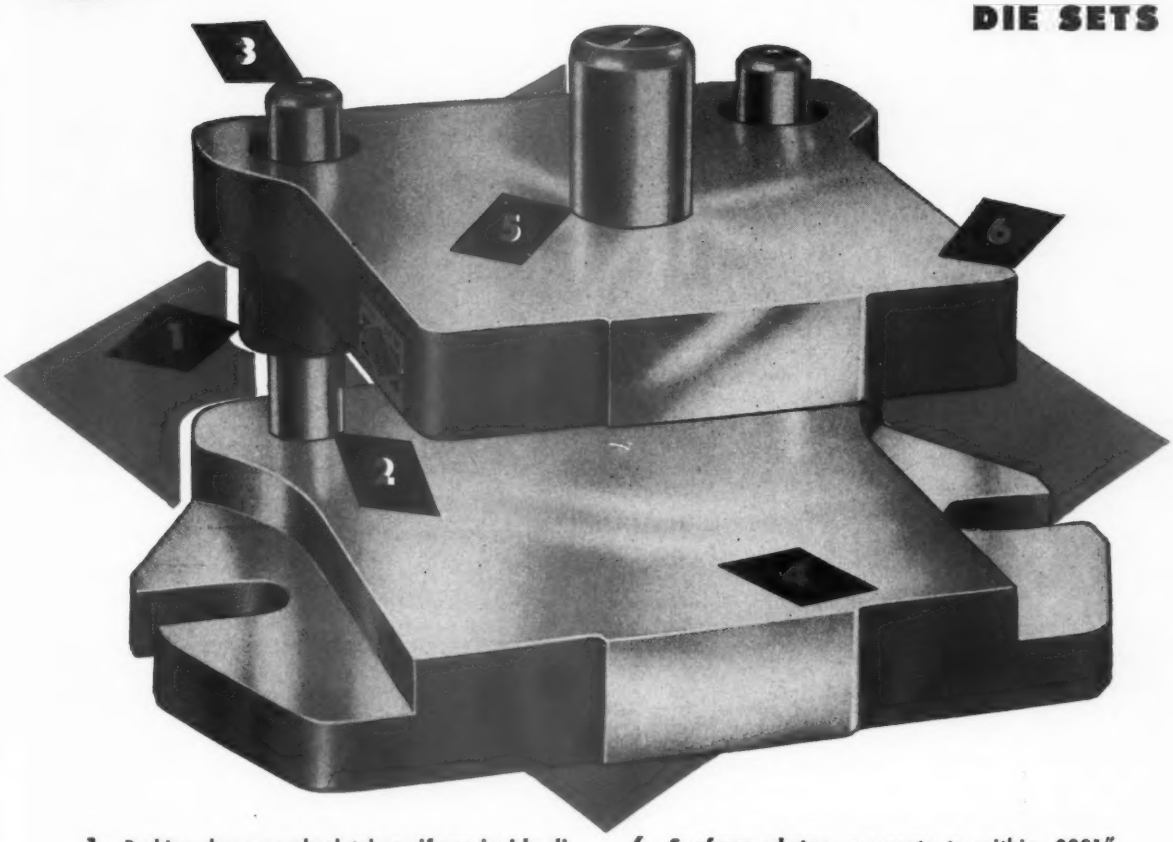

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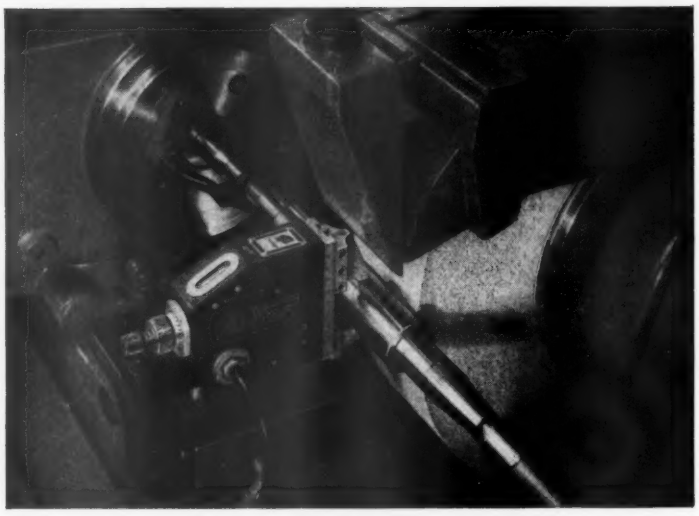

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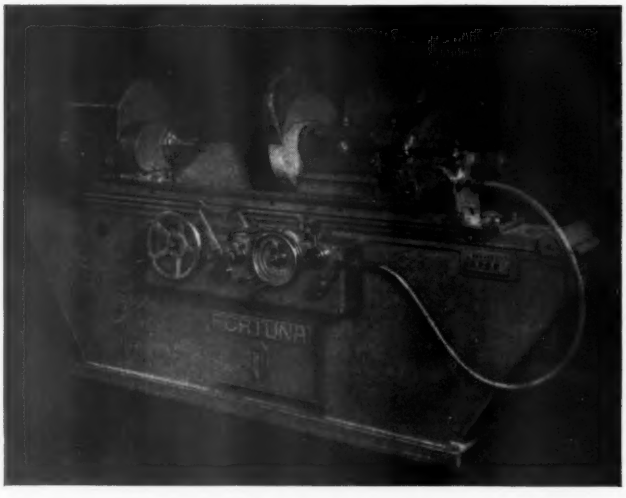

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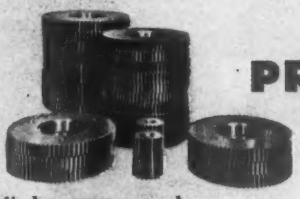

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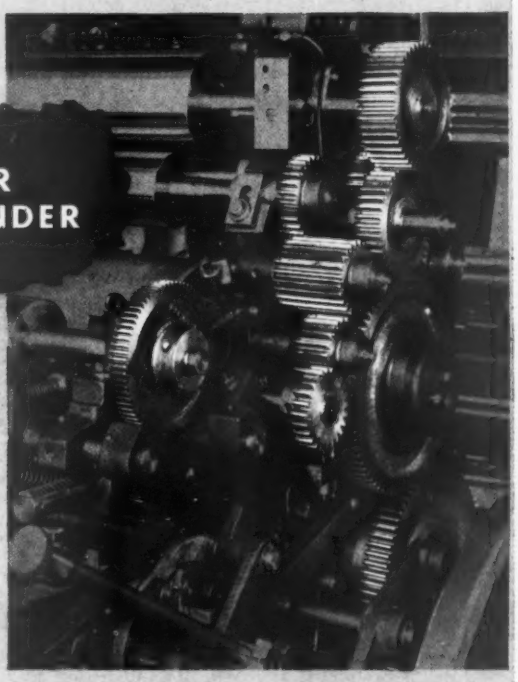

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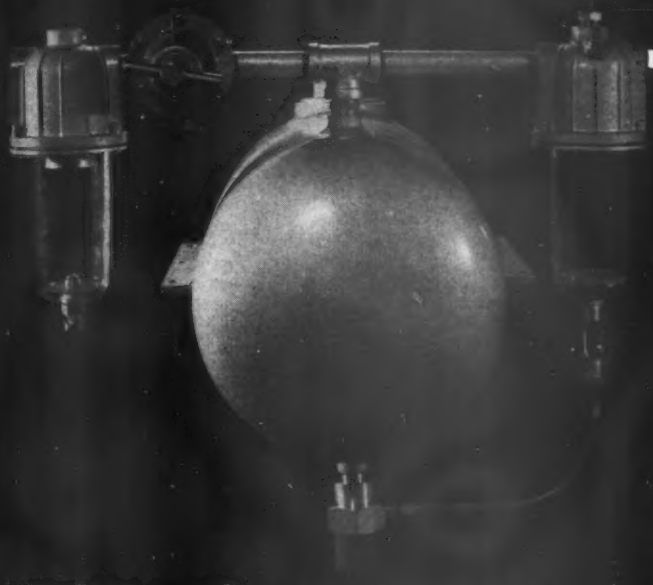

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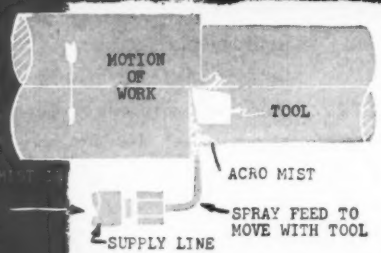

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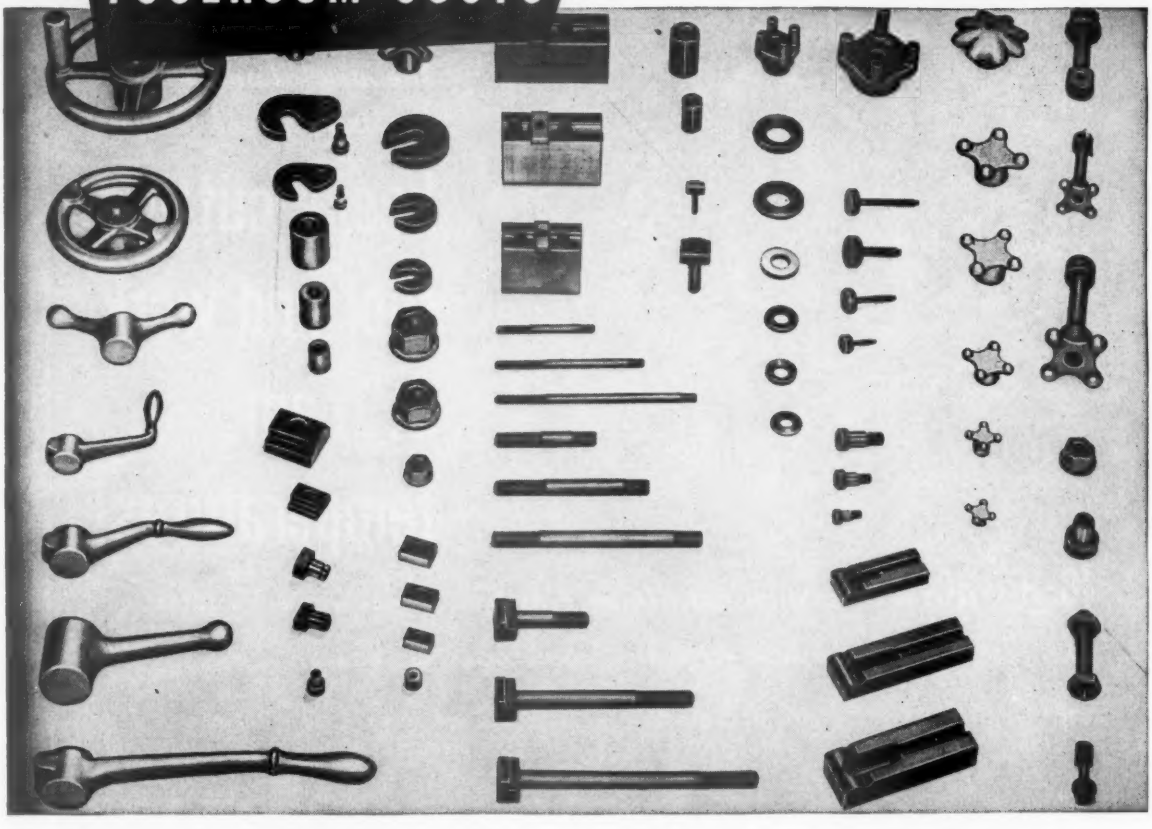

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editorial

here's one for you inventors

An editor has to be on constant guard against using his page as a typographical springboard from which he dives into troubled waters and either comes up with nothing of benefit to mankind, or just doesn't come up.

In the soul-searching and brain-beating procedure of building an editorial, we are confronted with two very simple choices. We can editorialize either on a subject we know something about or on one about which we know nothing. Ironically, an editor soon learns that his choice in this respect too often is not quite clear to the reader.

So, in order to set the record straight, it is declared here and now that the subject of this month's editorial is something about which we know absolutely nothing. Paradoxically, it is hoped that in this instance mankind may derive some benefit from our profound ignorance.

Subject: bent forks; and how can they be straightened?

At lunch this noon, the manager of the restaurant sat in with us at dessert. The conversation worked around to the various mechanical aids which are part and parcel of a large-scale restaurant operation: automatic dishwashers and sterilizers, electric-eye door openers and traffic counters, mechanical lipstick scrubber-offers, tumbling barrels for removing silver tarnish, tote trays, dish elevators, carts, etc., etc.

In the course of the conversation he disclosed that bent fork tines represent one of their major time and labor consuming headaches. It seems that in the handling, washing, dropping, stepping-on, racking, and even in the customers' hands, forks take a terrific beating. And there is nothing with much less eye-appeal than a fork with bent tines, to say nothing of its potential for inflicting injury.

He said, "If we only had a gadget that we could stick a fork into and have it come out with straightened tines, it would be wonderful."

To the best of his knowledge, there is nothing available for doing the job. Unbelievable as it may seem in this country, apparently a gadget has been overlooked. You can take it from here.

We admit abysmal ignorance as to the material from which the humble table fork is made, its metallurgical characteristics, springiness, cold workability, and other physicals. It does stand to reason though, that if fork tines are easily bent they should be easily straightened.

We can visualize some sort of a split die which in being clamped over the tines would do a straightening job. Possibly several die inserts would have to be at hand, although it seems that in the restaurant world fork dimensions are quite well standardized.

Possibly the job would require a pair of mating rollers, grooved to conform to the tine cross-section as it varies from point to base. The rollers might be spring-loaded in order to exert the straightening effort.

Maybe a simple jig, with a small, hardened arbor having a one-tine hole in it, could be devised. Index marks on the frame of the jig could show how far to swing the fork handle in order to straighten the tine and take care of spring-back.

Speaking of spring-back, it is possible that any straightening method should incorporate a strong electromagnetic "growler", the alternating current vibrations of which would serve to "set" the tines in their correct positions.

Preferably, your tine straightener should be power-operated and foot-controlled, leaving the hands free for manipulating the work.

Obviously, any device you concoct must not be destructive of the silver plating. This calls for a high polish on the tool surfaces which contact the tines.

So, there you are. If you can dream up a practical and economical fork tine straighten-outer before your wife gives you an indefinite leave of absence for bending her favorite forks in the interest of science and invention, you should surely receive the blessings of the American Restaurant Association.

Further, if you have any fun with this idea we would be delighted to hear about it.

E. Willard Pennington.

editor

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The rotating selector type switch which has been used for half a century in the telephone industry has only recently been applied in the control of industrial machines. Indications are that they will be applied extensively in automation systems for the control of machine tools.

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If you're interested in improving the operation of your present machinery in both the quality and quantity of its output, this article may suggest some ways electronic counting can help you.

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MATERIALS HANDLING. "Mechanized Handling of Plastics at Sylvania's Warren Plant" 56
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Automatically operated machines depend on electric switches for the control and operation of electric motors, solenoids, hydraulic and pneumatic valves. Mr. Riche discusses the selection of the proper switch for different types of operations.

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CONTROLS. "Electronic Production Control as a Means to Cost Reduction", by R. G. Canning, University of California 62

Production cost reductions can be divided into four phases: product improvement; methods improvement; better utilization of productive facilities; and reduction of overhead. Electronic production controls are applicable to all of these.

AUTOMATIC CONTROLS. "How Automatic Can We Get?" by Henry F. Dever, Brown Instrument Div., Minneapolis-Honeywell Regulator Co. 67

The so-called "automatic factory" has been much in the mind of business men of late. Mr. Dever gives one of the fullest and fairest treatments of this topic in these excerpts taken from his speech before the Boston Society of Security Analysts.

TRACING CLOTH. "Glass Cloth Applications in Industry", by C. F. Ivins, Jr., Keuffel & Esser Co. 114

Glass tracing and reproduction cloth is finding wide use in the aircraft, automotive and railroad body industries. Its main use today is in the manufacture of templates for large blanking and piercing dies.

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by H. E. Grimes THE AVEY DRILLING MACHINE COMPANY Cincinnati, Ohio

AUTOMATIC CYCLING OF MACHINE TOOL OPERATIONS

Use of telephone-type rotary stepping switches for automatic cycling of multiple machine functions.

FOR HALF A CENTURY, the rotating selector type switch has been used by the telephone industry, but only recently has it been applied to control of industrial and computing machines. The advent of automation, however, leaves little doubt that this device will find considerable use in the control of machine tools

One type of switch, (shown in Figure 1), sometimes used for a limited sequence of operations, is known in the Bell Telephone and Automatic Electric systems as a "minor" switch because its application is usually of a minor nature. The most common use is to select the proper ringing code or frequency on party lines. This switch is listed by C. P. Clare & Company as a direct-drive switch because the wipers move directly with the stepping magnet.

This stepping magnet operates a pawl that moves the wipers to the next contact, and at maximum stroke the pawl wedges against a stop that prevents the wipers from over-riding. A holding detent attached to the release magnet prevents the retractable spring from pulling back the wipers after the stepping magnet is de-energized. When it is ready to reset, the release coil—in series with the off-normal spring contacts—withdraws the holding detent to let the wipers rotate to the backstop. The off-normal springs are opened by an arm attached to the rotating wipers, thus de-energizing the release magnet. To obtain spark suppression, non-inductive resistances are wound on the coils. These parallel the inductive winding because these coils are energized by direct current, as are the other devices to be described.

This switch requires careful mechanical adjustment. When wipers are returning to normal, they pass back over all the previous contacts, so a means of opening the circuit to prevent operation of the various selected controls is needed. In telephone service, the release magnet is almost always operated in series with a relay that registers an alarm if the magnet is not released in a few seconds. The contact banks are limited to three levels.

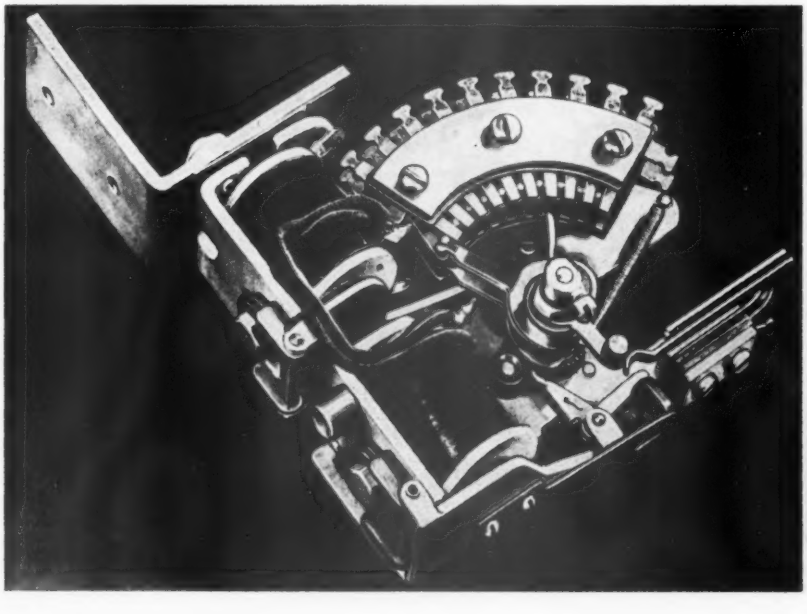

Fig. 1. This type of switch is sometimes used for a limited sequence of operations. It is known in the Bell Telephone and Automatic Electric systems as a "minor" switch because its application is usually of a minor nature. The most common use is to select the ringing code or frequency on party lines.

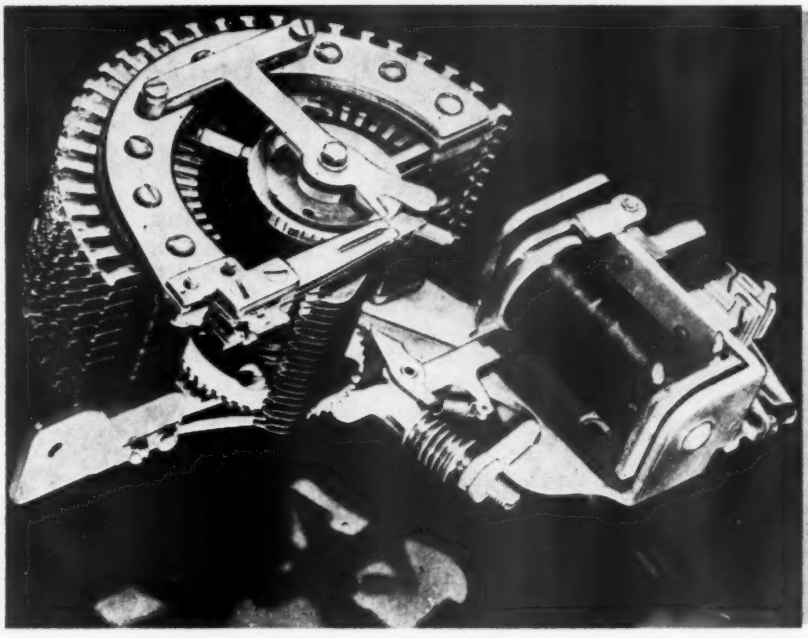

Fig. 2. This Automatic Electric type 45 switch is spring-driven and is more versatile because the wipers are advanced by the action of a spring-driven pawl when the magnet is released. This switch has contacts mounted in an 180° arc, with a maximum of ten levels on the contact bank.

A more versatile switch is the Automatic Electric type 45, also listed by C. P. Clare & Company as a spring-driven switch because the wipers are advanced by the action of a spring-driven pawl when the magnet is released, Figure 2.

This switch has contacts mounted in an arc of 180 degrees, with a maximum of ten levels on the contact bank. The wipers rotate in only one direction and are usually made with two sections so that one wiper enters the bank as the other leaves. An off-normal contact is operated at the starting position. When fully operated, the armature opens an interrupter contact (this is for use in self-impulsed circuits.) On a ten level bank, over 50 consecutive steps on five levels are possible by cutting off one end of five wipers and the opposite end of the other five wipers. The switch may be purchased with this type of construction.

Figure 3 shows a type 45 switch with a rectifier—for operation from 110 volts a-c.

The Automatic Electric Type 44 stepping switch, Figure 4, is in a class by itself. In construction and operation it is similar to the type 45, but is smaller and faster in operation. It

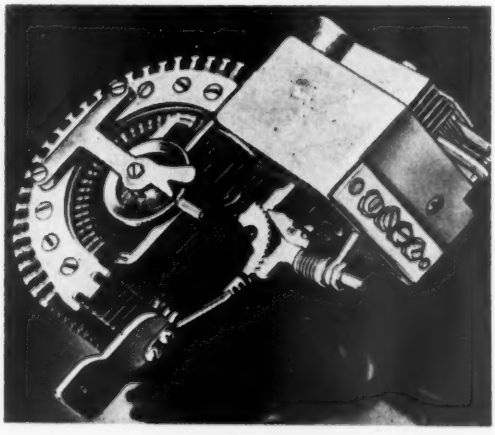

Fig. 3. For operation on 110 Volts A-C, this type 45 switch is equipped with a rectifier.

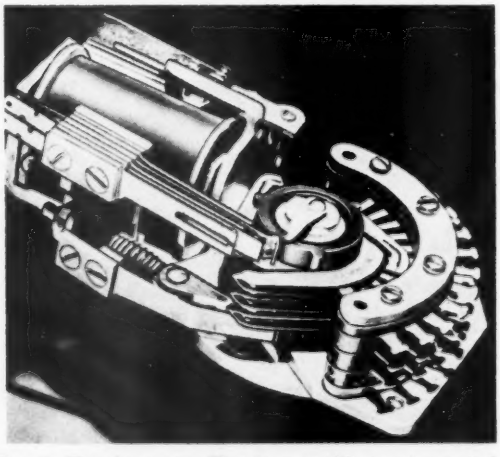

Fig. 4. The Automatic Electric type 44 stepping switch is similar to the type 45 construction and operation, but is smaller and faster in operation.

requires almost no adjustment except to readjust the pressure of the stepping spring after about 200 million steps. In the basic form, it has three sets of wipers per level. There are three points on a molded cam which operate

a set of off-normal contacts in the starting position. These contacts may be either normally-open or normally-closed, or one set of each may be used. A break-make interrupter contact is operated by the armature of the stepping magnet.

The wipers are split on each side, thus providing four points of contact. The switch is ordinarily provided with an eleventh contact on the first two levels. By removing two of the three wipers on each level and spacing the remaining ones 120 degrees apart, 32 or 33 circuits may be selected consecutively. A maximum of six levels are available.

Figure 5 shows a power supply that is suitable for operation of these switches from an A.C. line. It provides half-wave rectification, and a 40 Mf electrolytic condenser smooths the output voltage. In the circuit shown, spark suppression would be required and would be connected to the points marked 1 and 2. For the type 45 switch, a 6800-ohm, 1-watt resistor is required, while for the type 44 switch, a 500-ohm, 1-watt resistor is connected in series with a 0.03 Mf condenser.

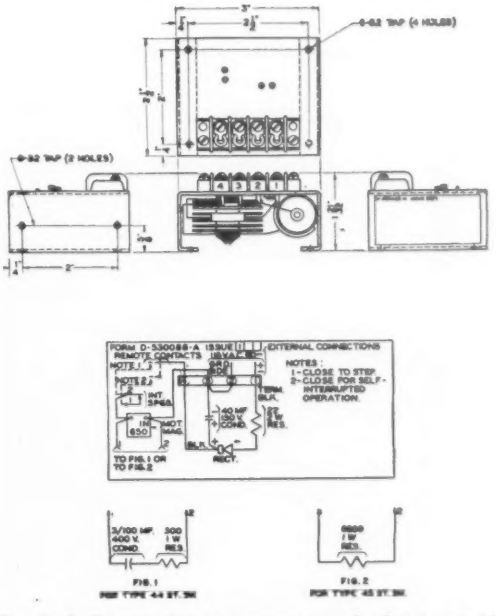

Fig. 5. A diagram showing a power supply that is suitable for operation of these switches from an A.C. line.

To obtain the long and reliable operation that this equipment can provide in machine tool control, several circuit design factors should be observed. First, and most important, the wipers should carry current only when at rest. The switch should be mounted in a tightly gasketed enclosure to exclude the oily, moist atmosphere which is found around machine tools. Since the contact assembly is given a high potential test of 500 volts d-c during manufacture, and since use of a low voltage would increase the current on the wipers, 110-volt control should be used. Contact current rating is 3 amperes when at rest. If it is necessary to interrupt the current flow with the wipers, limit it to 0.1 ampere — the maximum load should be size 00 relays. The switch coils are not designed for continuous energization, so the control circuit should be designed to hold the coil on "operated" no more than one second.

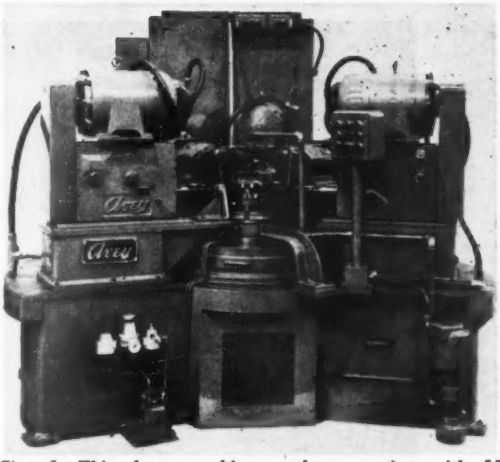

Fig. 6. This Avey machine produces a ring with 15 equally spaced holes that are drilled radially, milled with two cross slots per hole, back countersunk and tapped.

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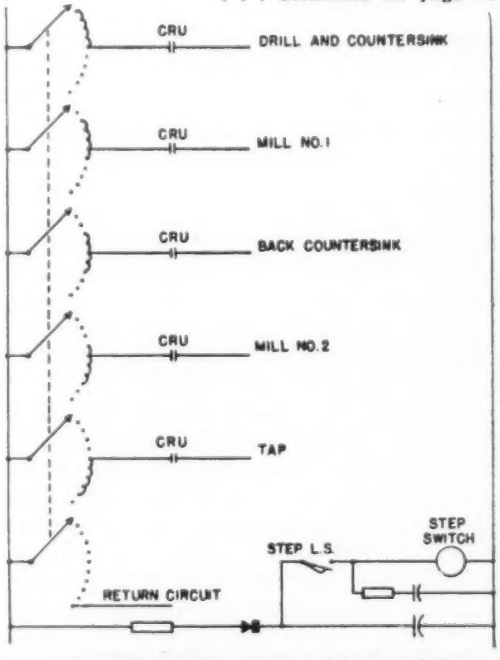


Fig. 7. A portion of the circuit used to control the machine shown in Figure 6.

Predetermined counter on production line to count preset number of units for bulk packaging.

PREDETERMINED COUNTERS MAKE MACHINES BEHAVE

by A. Venditto
and
L. Naum
POTTER INSTRUMENT COMPANY, INC.

WITH INCREASING MACHINERY SPEEDS, tighter production schedules, and mounting material and labor costs, modern production management is taking a closer look at modern ideas in industrial control. Most of us, if we think of the "automatic factory" or "automation" at all, tend to shrug it off as Buck Rogers stuff, too complicated, off in the future, or nice but not practical with present equipment or techniques.

T'ain't so! Automation, the science of controlling machinery with machinery, is here now, is practical, and because its cost is generally modest, the investment is returned quickly in production savings. If you're interested in improving the operation of your present machinery in both the quality and quantity of its output, this article may suggest some ways electronic counting can help you. It is the story of Predetermined Counters and how they can be applied to machine process.

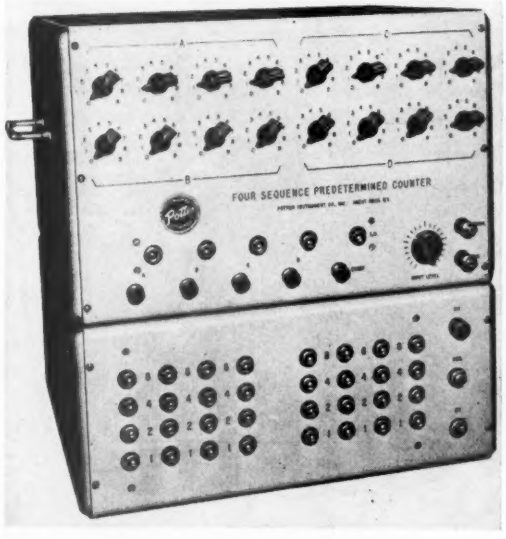


Fig. 1. 4-Sequence Predetermined Counter

Accurate Counting Means Close Control

In any machine where something is being turned, drawn, formed, cut, stretched, or assembled, maximum efficiency is reached when we know exactly how much we want and are able to set the machine to produce that amount with minimum operator attention and control. Two general approaches are used, Analogy and Direct Count measurement but only the latter has any real place in the modern factory.

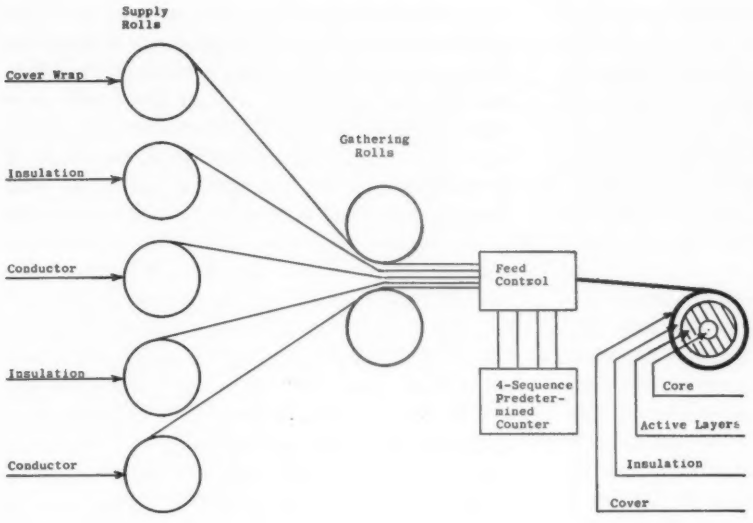


Fig. 2. Use of 4-Sequence Predetermined Counter to control automatic fabrication of a tubular capacitor requiring varying lengths and turns of material. The "sandwich" of conductor and insulation layers builds up in increasing diameter around the central core. Accurate control of the number of layers or turns is necessary to insure that the electrical capacity of all the condensers in one production run will be within the prescribed tolerance.

"Analogy" is the system of control that measures quantity by measuring something related to the quantity. Its weakness lies in the fact that it only approximates the thing we are after. Take a simple example. Let's assume a gross of machine screws weighs five pounds, and we've been counting out our batches by scale. In order to assure full count in spite of variations in the weight of the raw metal or slight changes in the forming machine, continual sampling is necessary. Even then, we'd probably introduce a safety factor of one or two percent just to be on the safe side. At best, this kind of counting can only be a good guess.

Or take the winding of a coil. This too can be done by weight with the same limitations outlined above. In order to wind a five hundred turn coil to the nearest turn, we'd have to know our scales were good to .02%, a practical impossibility. We might try to control turns by running the winder at a known speed for a predetermined time. Unfortunately, we have to make allowances for acceleration, for difference in machines, for shutdowns and other uncontrollable variations. Too much is often as bad as too little, and the analogous system produces a good deal of both.

"Direct Count" measurement is now accepted as the ideal method of control and can be applied in almost every machine process. It is simple, reliable, and requires far less maintenance than the machine itself. Instead of weighing a gross of screws, we count exactly 144; instead of running the coil winder for a number of seconds, we count the exact number of turns without reference to shaft speed or time of operation. In other words, we obtain our information directly, whether it be quantity, revolutions, lineal measurement, volume, or weight.

Counting Instruments

Counting instruments are either mechanical, electro-mechanical, electronic, or a combination of these basic methods. Mechanical counters provide only the simplest sort of control and suffer the usual trouble of machinery with moving parts—maintenance, limited operating speed, and the need for direct connection to the production unit. Fail-safe features are difficult to provide, and the use of such counters is generally restricted to indicating a total count or controlling a single cycle of operation. Features inherent in electronic systems such as multiple-sequence operation, automatic reset, etc. are difficult to accomplish.

Electro-mechanical counters provide some improvement over the simple mechanical style. They lend themselves to remote installation, can operate with less mechanical load on the driving machine, and can be adapted to a greater variety of processes. Because they are electrically actuated mechanical counters, maintenance problems can still be severe, and, the upper limit of practical operation is somewhere around 600 per minute.

Electronic counting is rapidly becoming the accepted way of making machines behave. Here are some of the reasons:

1. High speed. Rates from 0 to 60,000 per minute are standard practice. No adjustment

of the counter is necessary to adapt it to any speed in the range.

2. Accurate. Properly designed electronic counters are errorless. Whether the count is one or a million, the count is always exact.

3. Automatic. Action can be made completely automatic. Electronic Counters can count to a given quantity, start, stop, or adjust a machine, and reset themselves for a new cycle of operation.

4. Multiple-Sequence. Complicated machine operations can be closely controlled. Take the coil winder, for instance — a good example of a three sequence operation. To prevent breakage, it is desirable to start the winder at low speed; to increase production, the main body of the coil should be wound at high speed; and, to allow accurate stopping without excessive brake action, the winder speed should be reduced somewhat before the cutoff point. As we'll presently see, it's an easy job for electronic counting.

5. Fail Safe. Electronic counters cannot miscount. In the event of a tube failure, the counter ceases to operate and visible indication of the malfunctioning tube is given.

6. Reliable. Because there are no moving parts in the electronic counter, other than the control relays, trouble-free operation is the rule rather than the exception.

7. Compact. Small size and negligible power requirements make electronic counters easy to install in most applications. The ease with which remote installations can be made makes it possible to group the control of a number of machines at one point.

Electronic Counters

In order to understand how electronic counters can provide close supervision of machine cycles, it is necessary to know a little of how they work, and, in order to do that, some simple definitions are in order.

An Electronic Counter is a device which totals electrical signals supplied by a detector. The basic counter, called a decade, totalizes ten electrical impulses and at the tenth supplies an output pulse. Visible indication of the count progression is generally given. Since it is possible to use the output pulse of one decade to operate a second decade, the output of the second to operate a third, etc., there is no practical limit to the total which can be handled. Each time a count of ten is entered into the first decade, its output pulse advances the second decade one count which therefore counts in tens. Similarly, the next decade counts in hundreds, and so on up. The counter functions as a totalizing instrument and requires an operator to read the total and perform the machine setting manually.

A Predetermined Counter is one which senses and totals a count — inches, revolutions, number — and when the total has reached a desired amount, actuates a control which changes the mode of operation of the machine. It may reset for a new cycle of operation either manually or automatically. When the instrument is capable of providing more than one control total in sequence, it is called a Multiple-Sequence Predetermined Counter. Standard instruments in use today include single, dual, and 4-sequence operation. Each channel of the instrument is set independently of the other channels and is switched into control in sequential order.

The more channels available, of course, the greater the versatility of the equipment. The 4-sequence counter shown in Figure 1, has four channels each of which may be set for any count total from zero to 10,000. To illustrate a straight count control, let's take an assembly consisting of a machine screw, three spacing washers, two flat washers, and nut and let's assume we want 2500 such assemblies

Fig. 3. Single Predetermined Counter Decade

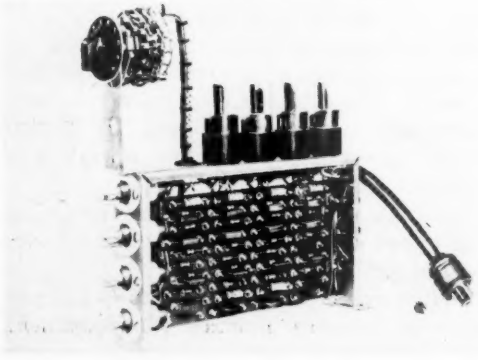
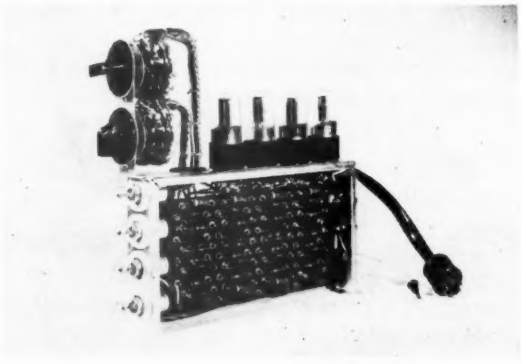


Fig. 4. Dual Predetermined Counter Decade



gathered in adjacent bins. Channel "A" controls the supply of screws and is set to count 2500, channel "B" for the spacers to count 7500, channel "C" for the flat washers to count 5000, and channel "D" for the nuts to 2500. As each count is made, a relay closes shutting off the material supply, advancing the tray one bin, and switching the counter to the next channel. There's no guessing and consequently no waste.

An excellent example of the application of 4-sequence counting to high speed, volume manufacture is the production of close tolerance tubular capacitors for electronic equipment. Figure 2 shows the method of assembly. The finished capacitor consists of a number of layers of insulating material alone to form the core, then a sandwich of alternate layers of conducting foil and insulation followed by a few turns of insulation alone, and finally the protective paper cover. Using a 4-sequence predetermined counter, the whole operation is kept under precise control. Sequence "A" is set for the core turns, and at the end of its count, the conducting layers are started. Sequence "B" determines the **length** of active material, sequence "C" the final insulation turns, and sequence "D" the turns of protective wrapping. It's interesting to note that in this type of application, it is easy to control to a fraction of a turn when necessary and the end point in precision is always reached by the machine itself long before the predetermined counter is operating at its limit.

Detectors are devices which translate mechanical action into electrical impulses. They are commonly photo-electric, magnetic, impact, or contact in operation. Photo-electric detectors operate by interrupting a light source focused on a light sensitive cell. Each time the light beam is broken or restored, an electric pulse is generated. Their great advantage is that they introduce no load on the machine and operate equally well at all speeds. Magnetic detectors are sensitive to the presence of metals or changes in the type of metal. They are useful as sensors for things made of metal, and for shaft revolution when a section of the shaft can be made of magnetic material. They are recommended over photo-electric systems where dirt or oil spray is encountered. Impact detectors find application where a count is to be made of such things as bolts, buttons, or other small objects which can be dropped through a chute. Contact detectors operate by displacing a feeler or arm to close an electric switch. Use of contact detectors is limited to low speed operation and to those installations where the actuating force is not an appreciable load on the machine.

The Predetermined Counter

A Predetermined Counter, **which both counts and controls,** is the basic tool of the automatic factory. One decade of a single predetermined counter, i.e., one which counts to a preset total from zero to ten is shown in Figure 3. It operates on the "complement" principle. Remembering that a decade counter provides an output pulse at the tenth counts, its operation and the meaning of "complement" will be clear. An artificial count, the difference between the desired count and ten, is introduced into the decade each time it is reset. Thus, for a count of six, the circuits are arranged to start after four; for a count of three, to start after an artificial count of seven. This is simplicity itself, and although other systems of predetermining have been suggested, nothing yet approaches this method in reliability and simplicity. The coincidence system, for instance, requires additional circuits and tubes to sense when the count has reached the desired total. Failure in the sensing circuits is not always evident and errors can result.

In practice, the single decade rarely provides the count capacity needed. Units of 100, 1000, and 10,000 are standard, and special instruments for predetermining totals of over a million have been supplied to industry.

A Dual Predetermined Counter decade is shown in Figure 4. Similar in general construction to the single type, it carries an additional presetting switch for multiple-sequence operation. Each count complement is set on the appropriate switch bank and transfer of counting from one to the other is done automatically as each channel reaches its predetermined total. The 4-sequence counter combines two dual counters with the circuits necessary to provide tandem operation, and techniques are at hand to extend sequential operation beyond that number if desired.

Where To Use Predetermined Counters

The odds are that there is a need for predetermined counters in your operation. Proof that you should check possibilities in your own plant is the fact that nearly every manufacturing industry that uses machine tools is now using predetermined counting to control them. Here's some of the ways these

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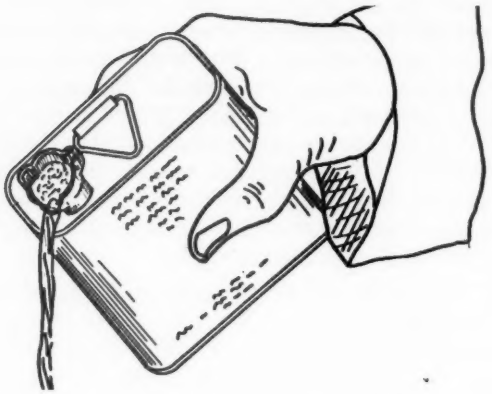
An Unusual Dial Press Operation

by N. M. Olney
Mechanical Engineer



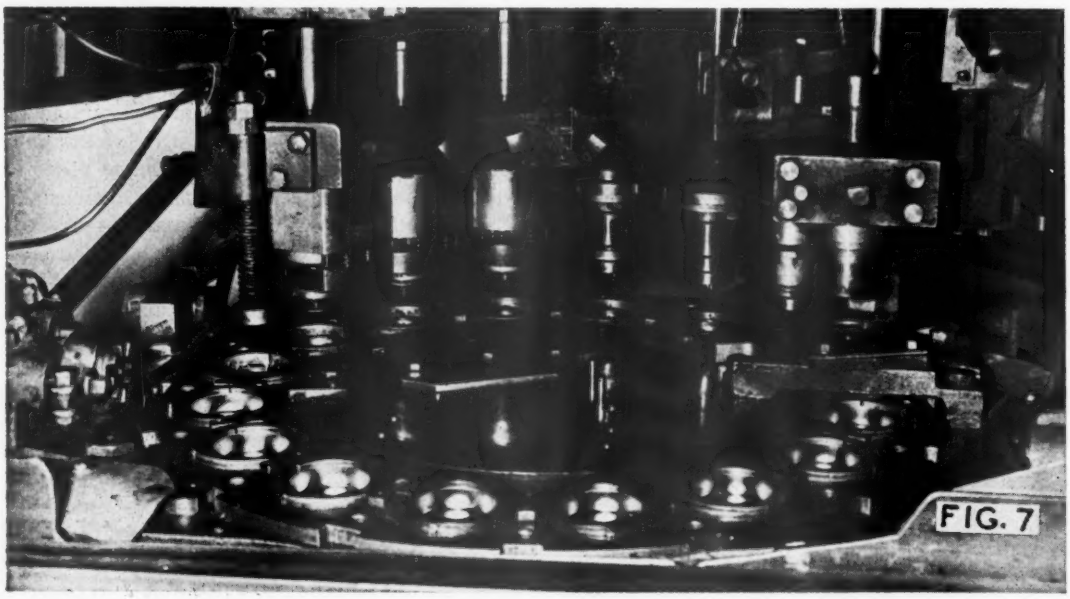
Mr. Olney's dial press story covers the press tools developed for producing pouring spouts as shown above. These are manufactured in wide variety and great quantities by the National Seal Corporation of Brooklyn, New York.

Cans in which a large number of fluid products are packaged generally are provided with a metal stamped nozzle or pouring spout enabling the consumer to readily pour out the contents, such as varnish, oil, paint, syrup, liquid cement, etc. It has been estimated that approximately 200 million or more such stampings are manufactured each year in a variety of types and sizes. Like the can, it is generally made of tin plate to resist corrosion and must be produced at the lowest possible cost.

One representative type is indicated in Figure 1, shown with a metal cap (dot and dash outline) in the front view. How this difficult part was tooled for economical manufacture in a rather unusual dial press operation will be described. However, before proceeding, it may be of interest to consider the development aspects of this product and some of the problems it presented to both tooling and manufacture.

The nozzle is made of .010" (90 lb.) tin plate. It was found that it would be considerably cheaper to use this type material with its protective coating rather than cold rolled steel which would necessitate plating the completed part at an added cost.

The dial press installation shown below is set up with 14 stations on a 24" diameter dial. It has an indexing arrangement, a specially built bolster, and ram bored to accommodate as many as six different upper and lower tools. A specially designed dial ring, shown in Figure 4, is installed in each station. Three spring actuated fingers incorporated in the dial ring provide a gripping action around the hub of the shell, thereby facilitating the positive and safe transfer of work from station to station.



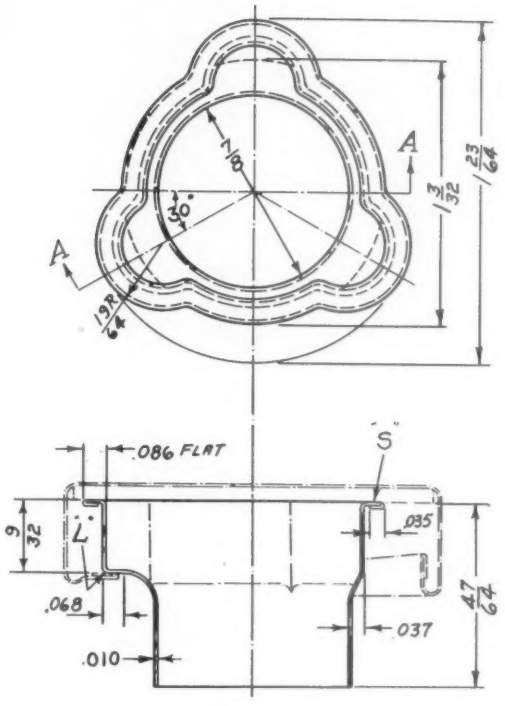


FIG 1

A study of the design, Figure 1, indicates that it is a relatively difficult part to make. The seating surface "S" must be absolutely flat along the entire surface to insure an air-tight seal. The corners at the base of the three lugs at "L" must be sharp for proper engagement by the cap. The 180° bend at the seating surface is made for the purpose of eliminating raw edges to prevent injury to the user during cap removal. The three pouring lips permit pouring the contents from any one direction and eliminates the necessity of accurate location of nozzle pouring lips with respect to the can in assembly.

One of the interesting features connected with this project was determination of the blank development. Since the finished part is partially triangular in form, it was assumed that the blank would be irregular in shape and that the re-drawn shell might require a trimming operation somewhere along the line. For a dial press operation, trimming would be highly objectionable since disposal of scrap and the possibility of slivers finding their way into the tools could be very troublesome. However, due to the symmetry of form, it was found that a round blank drawn into a flanged shell in the first operation permits this part to be made without any trimming—provided uniform hold-down pressure and equal distribution of material during the various operations was maintained. Figure 2 indicates the sequence of operations.

Equipment and Tools—The first operation is performed in a 15 ton single-action press with a combination blank and draw punch and die. The second, third, fourth and fifth operations, Figure 3, are run in a dial press equipped with a 14 station 24 inch diameter dial, an indexing arrangement and a specially built bolster and ram bored to accommodate as many as six different upper and lower tools. A typical dial press installation is shown in the photograph, Figure 7.

Since the dial press operates at approximately 130 strokes per minute, the problem of transfer from station to station in the light of rapid change of shape from round to triangular had to be solved. The part must be rigidly supported, as any misalignment due to vibration or momentum might cause a jam and seriously damage the tools. This was accomplished by use of a specially designed dial ring. Its function is to provide

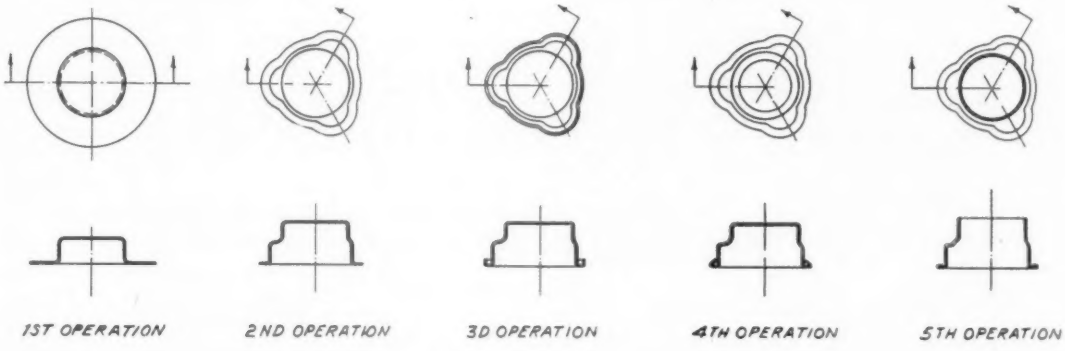


FIG. 2

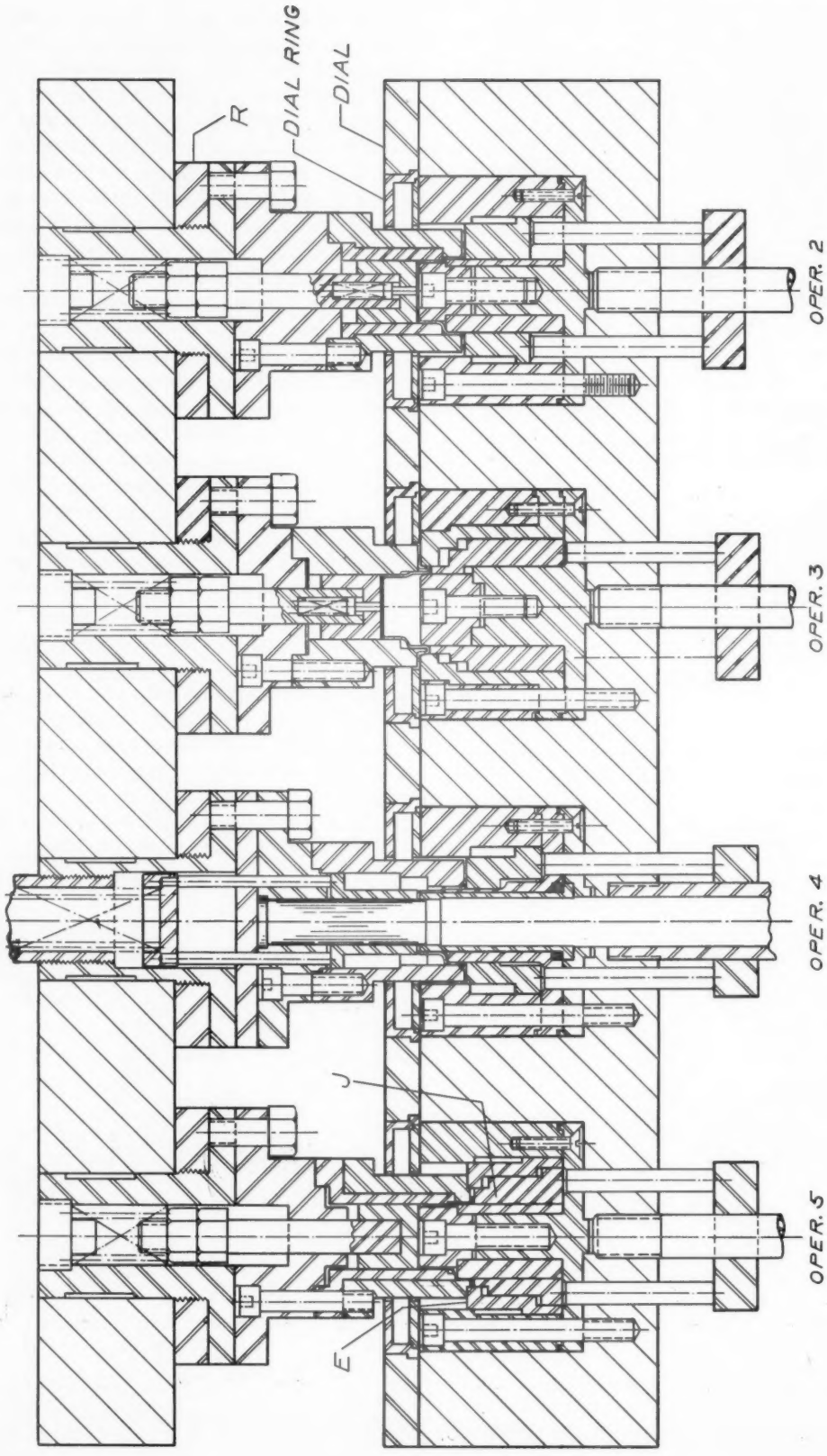
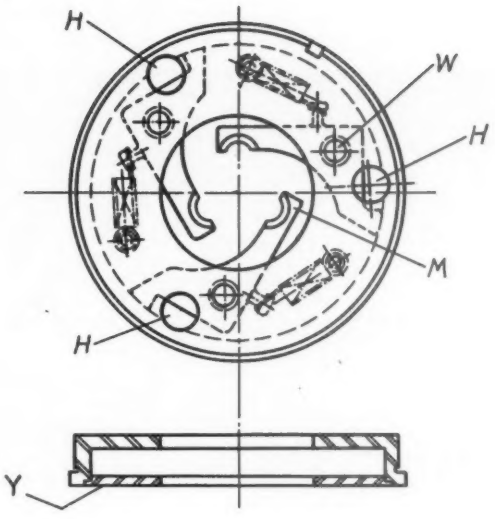


FIG. 3-SECTION THROUGH DIAL PRESS TOOLS



DIAL RING ASSEMBLY

FIG. 4

positive and safe transfer of work from station to station.

Each dial ring assembly, Figure 4, of which 14 are used, consists of a machined C.R.S. case with a clearance hole in the center for the part to drop in and permits punch entry into the lower die members. Within the dial ring case are three spring actuated fingers or bell cranks, "M," which pivot about pins "W," and provide a gripping action around the hub or dome of the shell whether the shape be round or triangular. A flat round base plate "Y" at the bottom of the dial ring shell retains the entire inner assembly. To insure proper relationship or registration of part to punch and die, each dial ring assembly is keyed to the dial.

The blanked and drawn shells from operation 1 are loaded into a hopper mounted on top of the dial press. The hopper is capable of discharging up to 200 shells per minute and may be loaded at any time during press operation. The discharged shells enter a rail type chute and pass down into a feeding mechanism, Figure 5, mounted on the hub or center section of the dial press bed surface.

On the down stroke the cam "D," Figure 6, mounted on the ram at the first station (inserting) pushes the cross slide through roller "C," moving the shell from point "B" into location "A," Figure 5, directly over the dial ring. As will be noted, cam "D" operates as a non-positive clutch to insure disengagement in order to prevent shell entry in the event of a jam at this station. This is accomplished by pivoting the cam at point "P" and providing a spring-backed clutch pin which engages the cam through an angle of 88 degrees under axial pressure. Should overload occur through any obstruction, the clutch pin will recede allowing the cam to swing away from the roller "C." It will remain in this position until repositioned manually. The cross slide, during its movement forward, simultaneously prevents a second shell from entering by passing in front of it. As the ram continues to descend, pins "K," Figure 6, enter the holes "H" in the dial ring Figure 4, and cause the three fingers "M," to open, permitting the shell to drop into position on the bolster plate. As the ram moves up, the pins recede and the three fingers close around the hub of the shell holding it securely. The dial is indexed and the shell is transferred to the next station for Operation 2, Figure 3.

At this station the round flanged shell is changed into a triangular shape forming the three pouring lips of the nozzle. Around the outside of the punch, as well as at Operation 3, 4 and 5, are three pins, similar to those used at the inserting stations, which actuate the dial ring fingers on the down stroke

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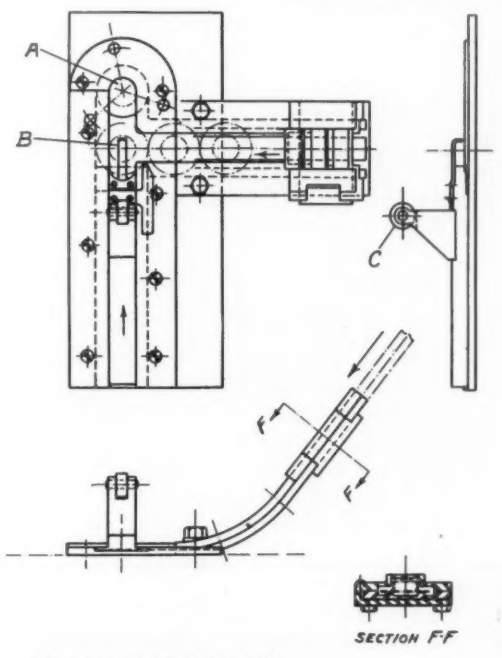


FEEDING MECHANISM

FIG. 5

AUTOMATIC LOADERS FOR CRANKSHAFT LATHES*

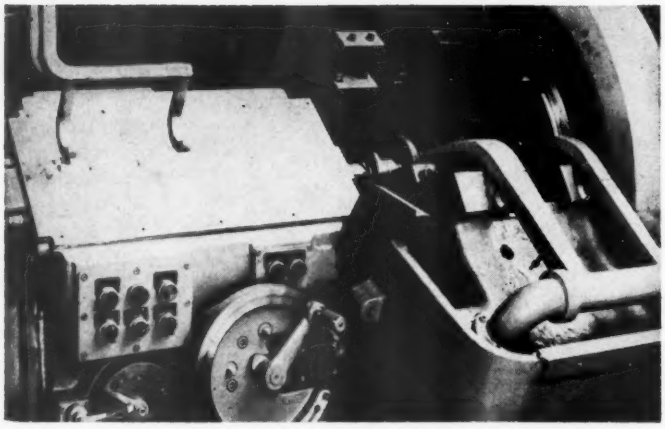


Fig. 1. Type 1LB line bearing lathe with crankshaft in position for machining.

LeBLOND CRANKSHAFT LATHES types 1 LB and 2LB for machining the line bearings, and type 6 AC for machining the pins, or for cheeking and pin turning were first designed with automatic loaders in 1950. The Ford Motor Company requested this design to reduce operator fatigue to a minimum, so that increased production made possible by the use of shell-molded cranks and tungsten carbide tools could be realized.

The first machines with automatic loaders were shipped in 1951 to the Cleveland, Ohio Engine Plant of the Ford Motor Company. They are now successfully machining shell-molded cranks at the rate of 46 to 50 per hour.

Experience now shows that crankshaft lathes with automatic loaders do make it possible to maintain a high rate of production at all times. However, the present machines with automatic loaders are really semi-automatic in operation because they require an operator to perform certain functions. Therefore, the production rate is still limited by the will of the operator.

Improvements are now under way to increase production further by making these machines fully automatic.

Due to the construction of these machines the automatic loaders must follow a definite curved path, changing directions in both the horizontal and vertical planes for loading. Another curved path is followed for unloading. This is accomplished by using mechanical motion, hydraulic power and electric control.

by Nelson D. Cooper
THE R. K. LeBLOND MACHINE TOOL COMPANY
Cincinnati, Ohio

Fig. 1 shows a crank in position in a 1 LB line bearing lathe. Because the crankshaft is located deep within the machine, a great advantage is gained by the use of an automatic loader.

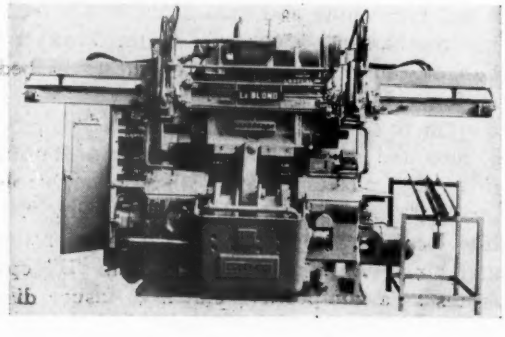
Fig. 2 shows the 1 LB single-center drive crankshaft lathe with automatic loader. A rack is shown on the right hand side to hold the rough cranks, but the left hand rack that receives the finished cranks is not shown. In fact, racks need not be used if some other arrangement is preferred.

The 1 LB automatic loader sequence of operation for rough cranks on the right is as follows:

After turning a crank, the machine automatically stops in the loading position which is definitely located by a lock pin inserted into a slot.

The operator unchucks the crank by means of a power wrench, leaving the wrench in place for chucking, and also unclamps the tailstock centers and moves them to the out posi-

Fig. 2. Type 1LB line bearing lathe with automatic loader.



tion. He then presses the load push button to start the automatic loader. The loader starts from the central rest position and traverses to the right hand end to close the contacts of limit switch LSA and stops against the right hand bumper block. This energizes a solenoid valve to cause the hoist pistons to go down. Rack and pinion drives from each piston operate a roller cam on each hoist through 360 degrees in the forward direction, causing both

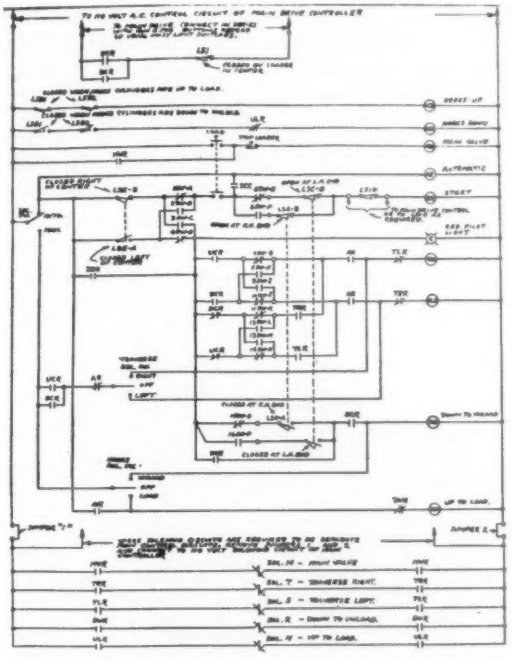


Fig. 3. Type 1LB automatic loader line diagram for rough cranks on the right or left.

hoists to go down the unload path and up again. The right hand hooks pick up a rough crank from the right hand rack and the left hand hooks pick up the finished crank in the machine. At the end of the down stroke, limit switches LSB1 and LSB2 close to energize a solenoid valve that causes the loader to traverse to the left hand end to stop, and contacts limit switch LSC. This energizes a solenoid valve to make the hoist pistons rise. The rack and pinion drives from each piston now operate the roller cam on each hoist through 360 degrees in the reverse direction thus causing both hoists to go down the load path and up again. The right hand hooks deposit the rough crank onto the chuck anvils in the machine and the left hand hooks deposit the finished crank onto the left hand rack.

At the end of the up stroke, limit switches LSD1 and LSD2 close to energize a solenoid valve that makes the loader traverse to the right, but stopping in the center rest position by opening limit switch LSE-A. This completes the loader automatic cycle.

Electrical interlocking is provided to insure that the loader is in the center position and is inoperative while the crank is being machined. Also, the machine is inoperative while the loader is in operation.

When the loader is operating it can be stopped in any position by pushing the "stop loader" button. This deenergizes the main valve only and blocks everything else as is.

A manual-automatic selector switch provides a means of selecting either manual or automatic operation of the loader. When set for manual, the loader can be operated from two three-position selector switches. One selector switch marked "traverse left-off-right" provides means for traversing the loader to the right or left. The other selector switch marked "hooks load-off-unload" provides means for unloading and loading the machine.

Fig. 3 shows a line diagram of the control

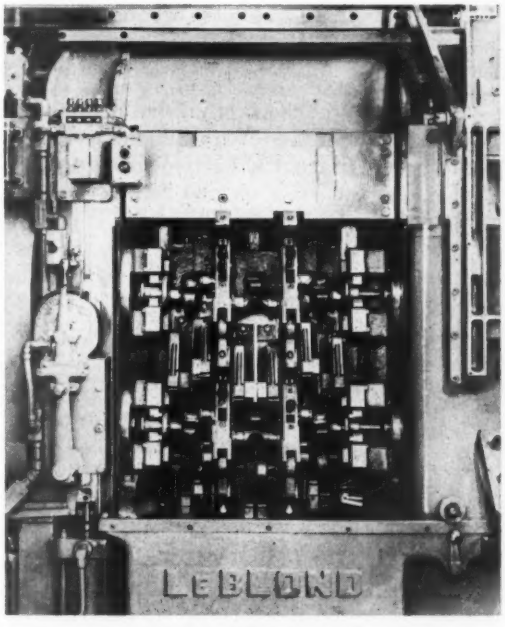


Fig. 4. Type 6AC pin lathe with two crankshafts in position for machining.

circuit for a 1 LB loader for operation with the rough cranks on the right or left. It provides means for use of a selector switch to quickly switch from left to right hand opera-

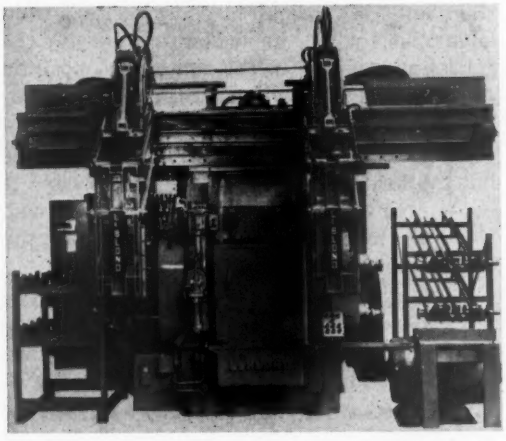


Fig. 5. Type 6AC pin lathe with automatic loader. (Door closed)

tion or vice versa. This is a requirement of a stand-by machine that must be used in either of two production lines or with a set of jumpers connected for right or left hand operation to suit its position in the production line.

Fig. 4 shows two cranks in position in a 6 AC pin lathe. Again, because they are deeply located in the machine, a tremendous advantage is gained by the use of an automatic loader to unload and load two cranks at the same time.

Fig. 5 shows the 6 AC crankshaft lathe with automatic loader and with the door closed. The rack on the right is for two rows of rough cranks and the rack on the left is for two rows of finished cranks. Fig. 6 shows this lathe with automatic loader and with the door open, and Fig. 7 is a side view that shows the

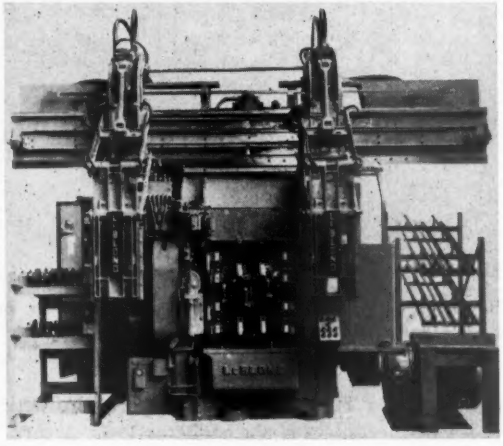


Fig. 6. Type 6AC pin lathe with automatic loader. (Door open)

two sets of hooks on each arm that are used to unload and load two cranks at one operation.

The 6 AC automatic loader sequence of operation for rough cranks on the right is as follows:

After turning two cranks, the machine automatically stops in the loading position. This is accurately located by a first cam position switch that plugs the motor to give automatic jogging at slow speed into the loading position. At this point, a second cam position switch disconnects power from the motor and plugs it to the final stop.

The operator opens the door, releases the steady rests and unchucks the cranks. He then presses the load push button to start the automatic loader.

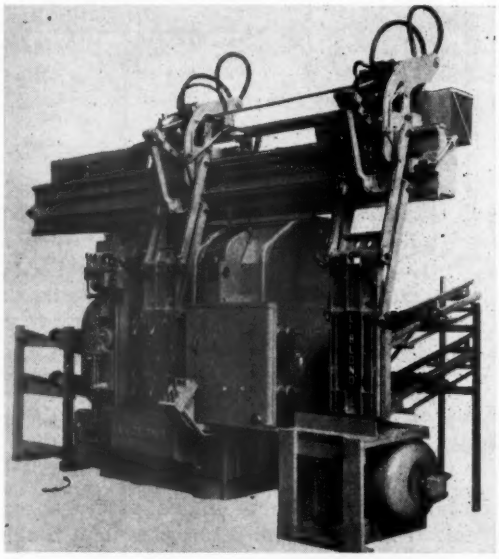


Fig. 7. Type 6AC pin lathe with automatic loader. Side view to disclose two sets of hooks on each arm.

The loader starts from the central rest position and traverses to the right hand end to stop against a bumper block where it contacts limit switch LSA. This energizes a solenoid valve and causes the elevating cylinder to lower the elevators with the hooks down. Fig. 8 shows the 6 AC pin lathe with the loader at the right hand end with the elevators down.

At the end of the elevator down stroke, limit switches LSBI-A and LSB2-A energize a solenoid valve that makes the left hand hooks pick up the two finished cranks, the right hand hooks and the two rough cranks.

At the top of the hooks' up-stroke, limit switches LSC1-B and LSC2-B energize a solenoid valve to cause the elevators to rise.

When the elevators return to the up position, limit switches LSB1-B and LSB2-B energize a solenoid valve to cause the loader to travel to the left hand end to stop and contact limit Switch LSD. This energizes a solenoid valve to lower the elevators.

At the bottom of the elevator down stroke, limit switches LSB1-A and LSB2-A now operate to energize a solenoid valve to lower the hooks. The left hand hooks deposit the two turned cranks onto the left hand rack or onto a conveyor, and the right hand hooks deposit the two rough cranks into chucks in the machine.

At the bottom of the hooks down stroke, limit switches LSC2-A energize a solenoid valve to cause the elevators to return to the up position.

When the elevators reach the up position, limit switches LSB1-B and LSB2-B energize a solenoid valve that causes the loader to traverse to the right where it is stopped in the central rest position by limit switch LSE-A. This completes the loader automatic cycle.

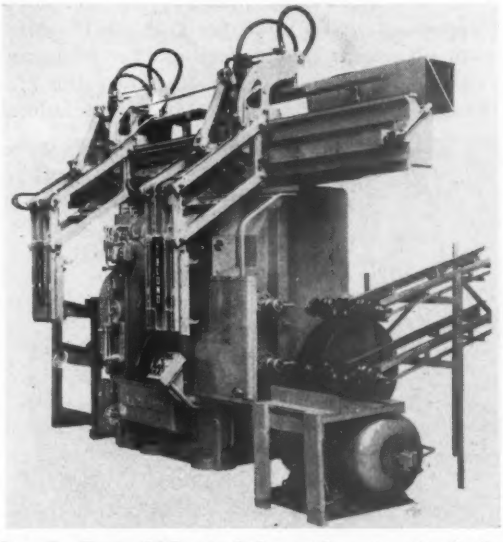


Fig. 8. Type 6AC pin lathe with automatic loader showing the elevators down.

Electrical interlocking is provided to insure that the loader is in the center position and is inoperative while the cranks are being machined. Also the machine is inoperative while the loader is in operation.

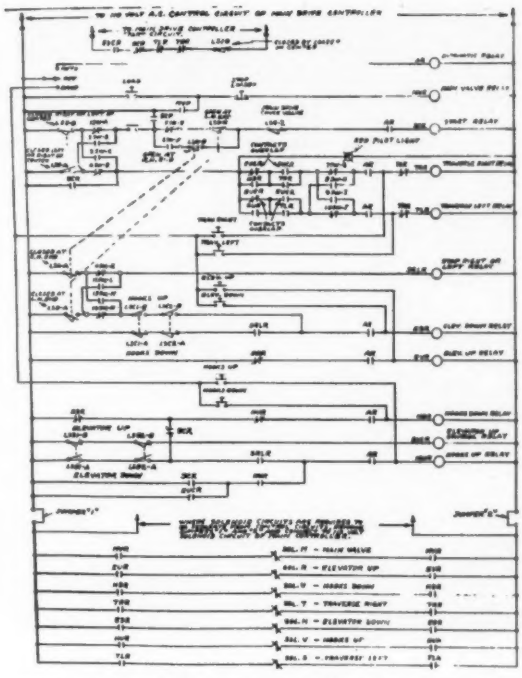


Fig. 9. Type 6AC automatic loader line diagram for rough cranks on the right or left.

When the loader is operating, it can be stopped in any position by pushing the stop loader button. This deenergizes the main valve only and blocks everything else as is.

A manual-automatic selector switch provides means for selecting either manual or automatic operation of the loader, and when set for manual, each movement of the loader can be operated by push buttons.

Fig. 9 is a line diagram of the control circuit for a 6 AC automatic loader for operation with the rough cranks on the right or left. It provides means for use of a selector switch to quickly switch from left to right operation or vice versa. This is a requirement of a standby machine that must be used in either of two production lines, or with a set of jumpers which can be connected for either right or left hand operation to suit its position in the production line.

*Presented at the 17th Annual Machine Tool Electrification Forum, sponsored by the Westinghouse Electric Corporation, Pittsburgh, Pa.,

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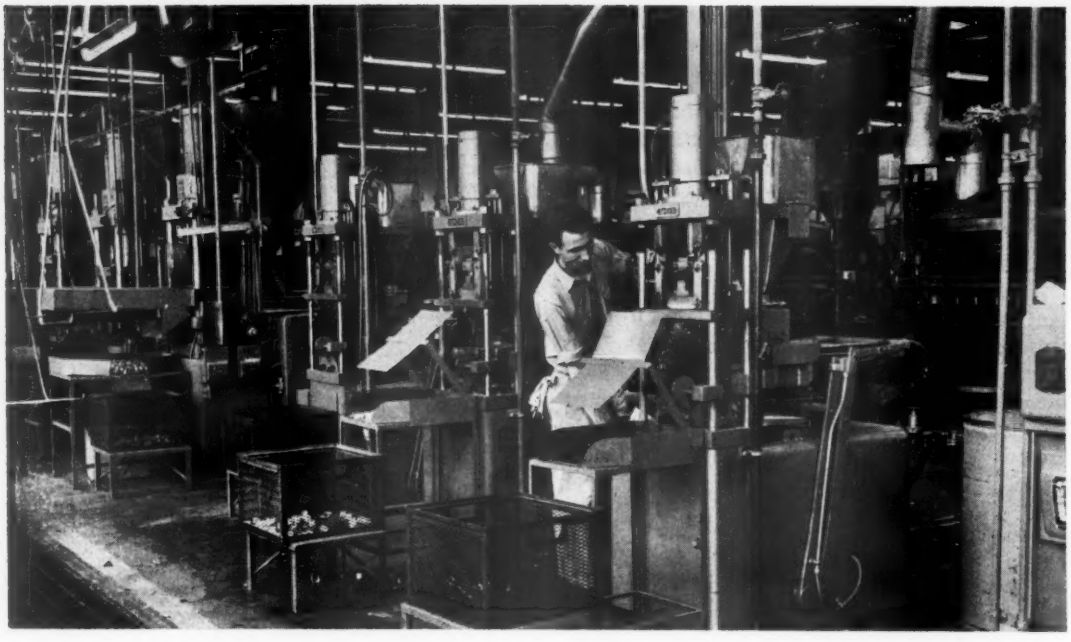


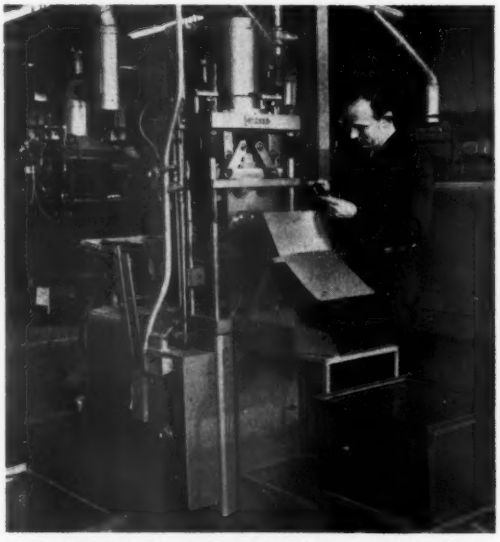
MECHANIZED HANDLING OF PLASTICS AT SYLVANIA'S WARREN PLANT

FOR MANY YEARS, the radio industry has been a large user of plastic molded parts . . . and the same is true of the lighting industry. Although not organized until 1945, the Plastics Department of Sylvania Electric Products, Inc. is today a major producer of plastic molded parts for the electrical industries.

At Sylvania's plant in Warren, Pa., the principal plastic products are radio and television tubes and sockets, flourescent-lamp bases and lampholders, thermostat dials, and a multitude of associated small parts used in the radio, television, and lighting divisions of the company. More recently, Sylvania has further diversified its output and has been making bottle caps, plastic compacts, push-buttons, spouts, and other small parts.

The mechanized plastics department at Warren has completely automatic compression and injection molding machines, as well as conveyorized materials handling. An overhead conveyor carries finished parts from compression-molding machines to tumbling facilities, while, underfoot, a grid-covered chain conveyor takes scrap to outdoor hoppers from which it is trucked away periodically.

Metal parts, such as wire, rings, and contact pins, are speedily assembled in plastic tube bases and sockets by means of specially developed automatic machines that need a minimum of attention. Inspection is mechanized to keep up with the high output of the machines. A conveyor, for example, runs behind



Automatic production of crystal sockets on a Stokes Model No. 800 compression molding machine. Operator has only to periodically fill hoppers and remove automatically-ejected parts.

a bank of staking machines to pick up radio-tube bases in which contact pins are assembled. One inspector for each two machines checks finished parts as they come through on the conveyor from three machines that automatically assemble liners in bottle caps or "closures."

Molding Equipment

Molding equipment is grouped under several types such as compression, transfer, and injection. Compression molding may be further broken down into hand-operated, semi-automatic, and automatic. In hand operation, the only mechanical operation is that of the pressing itself. The powder must be measured into the molds which are then closed and placed in contact with the hot platens of the press. After pressing is completed, the molds must be removed and the finished piece ejected from the mold. This was the method first used in the industry and it is still used at Sylvania for experimental runs and for molding intricate shapes requiring disassembly of molds or the placing of difficult inserts.

In semi-automatic molding, the mold is fastened rigidly to the heat platens of the press with ejector pins operated by movement of the press. The operator removes the finished piece by hand, loads the powder into the cavity, and starts the press closing. Usually the press opens automatically at the end of a predetermined time, regulated by the operator, or it may be run wholly by hand. An automatic machine performs all the operations once the machine has been set up for a particular job. It is necessary only to keep the powder hopper replenished and remove the finished product from bins as they become filled.

As ejector pins lift finished parts from the mold, a stripper comb automatically advances to carry parts off the pins and out of the press.

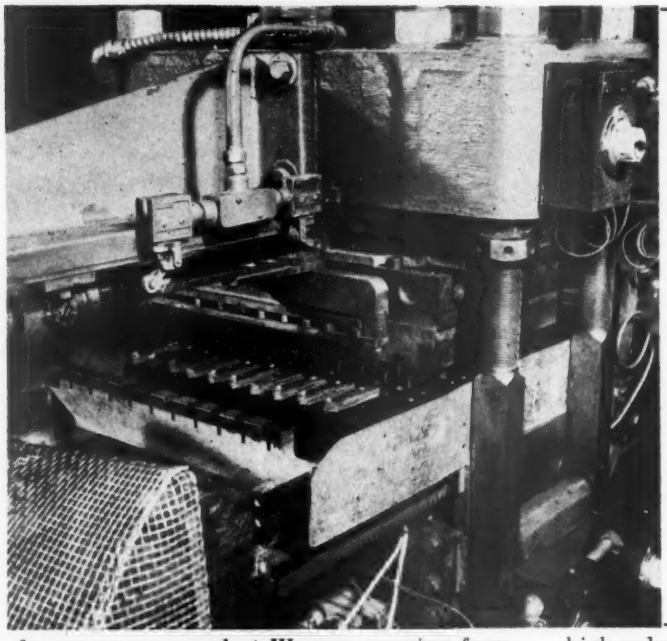
One tube base every two seconds is made in 20-station Cropp rotary compression molding machine. Three tons pressure is applied on each station for molding phenolic-resin tube bases, with 40-second curing time.

In compression molding the powder falls into the heated mold and turns into a plastic mass as the mold halves come together. The material is confined by the mold and is subjected to heat and pressure until polymerization takes place which hardens the compound into the finished product.

In transfer molding the powder is usually preformed and radio-frequency heated. It is then placed in a cylinder which is connected to the mold proper by a small orifice. A tightly fitting plunger subjects the preform to pressure until it becomes liquid and is forced through the orifice into the mold. Here heat and pressure cause the material to harden; the action is similar to compression molding.

Injection molding is used only with thermoplastic materials. Here the material is heated until it becomes fluid and it is then forced out by pressure through a nozzle into a relatively cool mold where it hardens to shape.

The 15-ton automatic compression presses manufactured by the F. J. Stokes Company were among the first fully-automatic molding presses commercially available. From these basic presses were developed the automatic



Automatically fed with phenolic resin preforms, this 50-ton Stokes press turns out spout caps for lighter-fluid containers. A 90-cavity mold provides high production, at 1½ minutes cycle time.

In brief, the type of machine in which a part is to be molded depends entirely on the product, and for this reason several kinds of machines are required in a well-equipped plant like Sylvania's. Where cost is a prime consideration and volume is high, a rotary press is used. If, on the other hand, the piece is of more complex design and quality must be held at the highest level, it must be made on one of the other machines.

closure presses used at Warren, ranging from 50 to 150 tons. Sylvania recently installed a battery of five Stokes late model #800 plastics molding presses to make 15 different plastic items, including automobile-type fuse holders, fluorescent slim-line lamp holders, and radio crystal sockets. As a result, production on these parts has increased 50%.

Sylvania also has installations of earlier Stokes automatics, including Models #741, #200D-3, and #252. One operator can handle a dozen or more, and his work consists only of filling the hoppers with molding powder and removing the finished parts at regular intervals.

Nearly concurrent with the development of these presses, starting about 1931, the hydraulic rotary press was evolved by Lauterbach for the molding of closures. Some 10 years later a fully mechanical rotary press was developed by the Cropp Engineering Company for the same purpose, and about seven years ago Sylvania began to use these machines in the manufacture of radio tube bases and other parts.

The salient feature of the Cropp press is its high production rate with relatively low initial mold cost. One machine will produce, on the average, approximately 40,000 radio tube bases per day; ejecting, feeding, and closing of the mold are all accomplished in approximately three to five seconds. Since, in any other type of automatic compression machine, this same cycle requires from 15 to 30 seconds, these machines lend themselves to the production of high-volume, low-cost parts of relatively simple design.

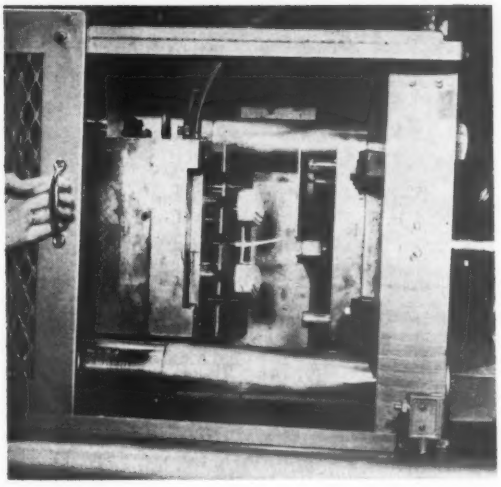
Product & Mold Design

Molding and mold design are closely tied together, and the problems of both must be considered carefully in starting a job. Certain types of molding presses are suitable for one article and not for another, and the choice of a press is determined by the size of the object to be molded, the type of material, the method of removal, the pressure capability of the press, and the number of pieces desired. Knowledge gained from working with many jobs and trying various ideas may also influence the decision.

In the manufacture of a new article the preliminary design is worked out with emphasis being placed on simplification of the mold to eliminate undercuts, sliding cores, hand-placed inserts, and other expensive items which result in high tooling costs. Cross-sections are watched for uniform cure, parting lines are located, dimensional tolerances determined, and numerous other factors important to each article are considered.

Care is taken in specifying the required tolerances of molded plastic parts, because the cost of molds is usually directly proportional to these tolerances.

After the product is designed, some changes may be necessary for efficient molding. When these have been reviewed and approved by the ultimate user, the final design is then proved by a sample cavity. If further changes



Fluorescent lamp end caps made two at a time by automatic injection molding. Micro switches control a hydraulically operated stripper comb that moves in as mold opens.

are indicated, they can easily be made before expensive multi-cavity tooling has been completed.

Auxiliary Operations

Besides molding, there are numerous other operations such as powder preforming, flash removal, afterbaking, staking of pins on radio-tube bases and fluorescent lamp bases, lining of closures, storage of powder and finished goods, all of which requires definite sequence and process layout.

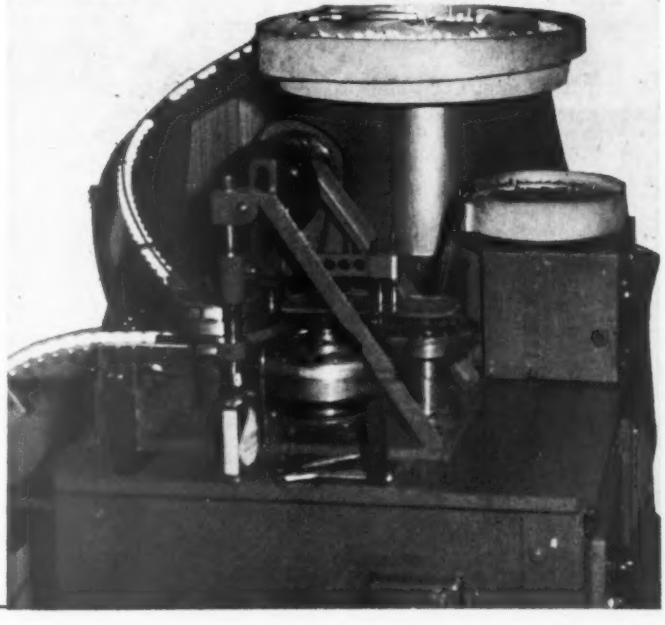
The effectiveness of the whole arrangement is entirely dependent on efficient materials movement to and from each process. The problem is to maintain flexibility for handling different types of powder and different products from day to day, and to provide for future additions of equipment. It is also necessary to keep production from the various machines separated while, at the same time, flowing to the next operation in an orderly and efficient way. Batch handling of powder and molded parts is logical.

Molded castings from the press are spot-inspected by the operators as they are periodically swept off the catch trays on the machines into specially designed expanded steel tote trays. These are placed on a conveyor, which moves the castings to the tumbling area. Here, the castings are loaded into the top of an automatic tumbler, using an automatic hoist. After completion of the tumbling cycle, the tumbler tips and deposits the articles on an inspection table from whence they are swept into wire boxes.

Closures are moved to the lining machines and other articles may go on to further finishing or assembly operations such as pin staking of tube or lamp bases. In staking, the bases are fed automatically to the staking machine from Syntron (vibrating bowl type) hoppers and, after staking, are deposited on an inspection conveyor.

All manual handling of material or parts in this layout is for positioning purposes only, with a minimum of manual movement required.

This automatic machine assembles spouts and caps for cans, such as are used for lighter fluid and household oils. The white spout, an injection molded part, is fed by a centrifugally vibrating hopper (above). The red cap, a compression molded part, is fed by the similar lower hopper. Both parts are fed into dual Geneva synchronously-indexed dials. The dial receiving the caps has individual rotating spindles. Thus the cap, which has a right hand internal thread, is threaded to the spout to any desired tightness. The machine will also extract those parts that do not assemble because of breakage, defects, or any other reason.



How to

SELECT PRECISION SWITCHES

by A. L. Riche
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WHEN LINE SHAFTS came down, the control of electric motors by limit switches and interlocks marked the beginning of progress toward the automatic factory. Electric switches originally used were bulky, relatively shortlived, and lacked precision of performance. In spite of these defects it was recognized that a mechanical motion can be made to produce an electrical impulse which can be made to control almost any kind of motion. That is, an electric switch can substitute for the eyes and the sense of touch of an operator, and electric motors, solenoids, and hydraulic and pneumatic valves can be made to respond faster and with greater reliability than can human hands.

The needed precision and reliability of the sense of touch were developed in the early 30's in the form of precision, snap-acting switches. Development of electric "muscles" to translate switch action into the needed controls have kept pace. Electronic developments are now being used to supplement switches in Industry's drive toward doing more things automatically—faster and better than can be done by human operators.

Switches have been put to so many different uses that a great many kinds have been built to fit the various jobs. A few are shown in Figure 1. Perhaps the most common characteristic demanded is compactness combined with substantial electrical load capacity. This requirement is well met by a wide selection of the so-called "basic" switches. In general such switches are housed in molded plastic cases and are operated by reciprocating plungers extending through the wall of the case. In some cases there is rotary actuation.

Fig. 1. Typical snap-action switches.

The smallest switch now available is little larger than the eraser assembly on the end of a lead pencil. This switch is rated by Underwriters' Laboratories at 5 amperes up to 250 volts a-c. The more usual requirements are met by a thumb-sized unit with an electrical rating as high as 20 ampers up to 440 volts a-c. Such switches are operated by motion of the operating plunger of 0.0003" to 0.005", depending on the type. Most actuator mechanisms provide for a prescribed amount of overtravel, which is needed for most machine uses. Where switches must be protected against the entrance of oil or mechanical damage, metal housings combined with overtravel actuators have been built in great variety.

The mechanical and electrical characteristics and the design of housings and actuators for switches are usually fitted to the job at hand. This is more economical than to be dependent on the use of a few standardized switches and to build special operating gear into each machine.

Combinations of characteristics with various actuators and housings give switch users over 6,000 different units from which to choose the one which will best fit the job at hand. For emergency, experimental, and short-run tooling, of course, it is practical to

maintain a relatively small inventory of switches that will be useful on a wide range of applications.

Snap-action switches are used for three primary classes of application, where they function as (1) limit switches, (2) control switches, or (3) safety switches.

Limit switch applications are those in which a switch is used to break a circuit when a moving subject reaches a predetermined point.

Control switch applications are those where a switch closes a circuit to initiate the operation of some other device or devices, usually as a step in a process control sequence.

Safety switch applications cover a wide range of uses where the switches prevent malfunction of equipment, prevent operation of machines until safety guards are in place, break circuits when doors of electrical control panels are opened, etc.

Switch Operation

In a snap-action switch, the moving force against the plunger depresses the center or cantilever member of a three-blade beryllium copper spring (Fig. 2). At a certain point in the plunger's downward travel, the opposing force provided by the two side or compression blades of the spring is overcome. At this point the spring snaps over, carrying the movable contact on the outer end of the spring from one fixed contact to another. As the applied force on the plunger is removed, the spring-mounted contact snaps back into its normal position against the upper fixed contact.

The amount of travel of the actuating force, or the moving subject being "sensed",

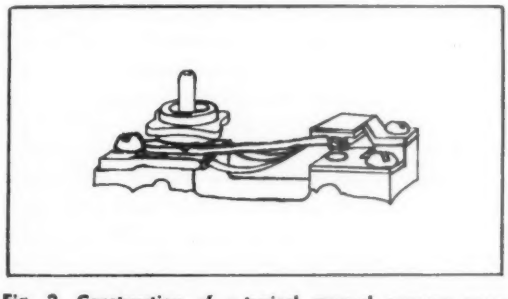

Fig. 2. Construction of a typical general purpose snap-action switch.

must be in excess of the **movement differential** of the switch (Fig. 3). In many instances, a relatively short travel may be amplified by using a lever actuator system.

The rapid snap-action feature of these switches provides immediate electrical response to the movement of the plunger across the operating position. The motion of the switch spring is in the same direction as that of the operating plunger, permitting accurate repeat performance. The rapid snap action also reduces arcing and is an important factor in the long life of these switches.

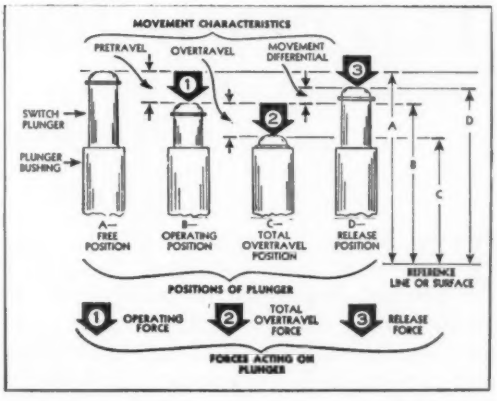

Fig. 3. Sequence of operation, over-travel, and release of the switch plunger.

The amount of force available to actuate the switch will determine, to a limited extent, the choice of switch actuator design. By the employ of various lever systems, the available force often may be increased to a value sufficient to operate the switch.

If the actuating motion over-runs more than a few thousandths of an inch after snap-over of the switch contact occurs, the switch selected must have an actuator with sufficient inherent overtravel to prevent breakage of the case.

Most standard switches will withstand a static load of 50 pounds, acting in the line of plunger travel. If operating forces are substantially below the 50-pound limit, no overtravel is required to protect the switch against breakage.

The simplest form of operating plunger is the "pin" type (Fig. 2). Force applied to the plunger is transmitted directly to the spring. One variation provides for overtravel by incorporating a preloaded spring under a hardened steel plunger tip set in a steel sleeve. This same type is available with a dust boot to keep out dust or abrasive particles.

Another method of providing overtravel is to use a leaf actuator which is attached at one end to the switch housing. Force applied to the other or outboard end of the leaf depresses the "pin" plunger. This mechanism is useful where the switch is required to operate

. . . *Continued on page 66*

ELECTRONIC PRODUCTION CONTROL

. . . as a Means to Cost Reduction

by R. G. Canning
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THE FIRST, and perhaps most common, aspect of cost reduction is that of product improvement—redesign of the product to simplify or eliminate parts, make for easier fabrication, and so on. The second aspect is methods improvement, a familiar subject to those in Industrial Engineering; this calls for more efficient use of tools, work space, motions, and the like. The third aspect is better utilization of productive facilities; this includes production planning, loading and scheduling, and covers more efficient decision-making and more effective control. The fourth aspect is reduction of overhead, by the mechanization of the office.

In another paper[1] delivered during the 1953 ASME Semi-Annual Meeting, Dr. M. E. Salveson has indicated a mathematical framework for the loading and scheduling of productive facilities. The development of such a mathematical model is most important, because it would provide production management with a systematic means of determining optimum (or near-optimum) loads and schedules. The application of mathematical methods in practical situations will undoubtedly depend to a great extent upon the use of electronic data processing equipment. But the introduction of such electronic equipment can also result in the reduction of overhead, by mechanization of the office, if an adequate systems design is considered from the outset.

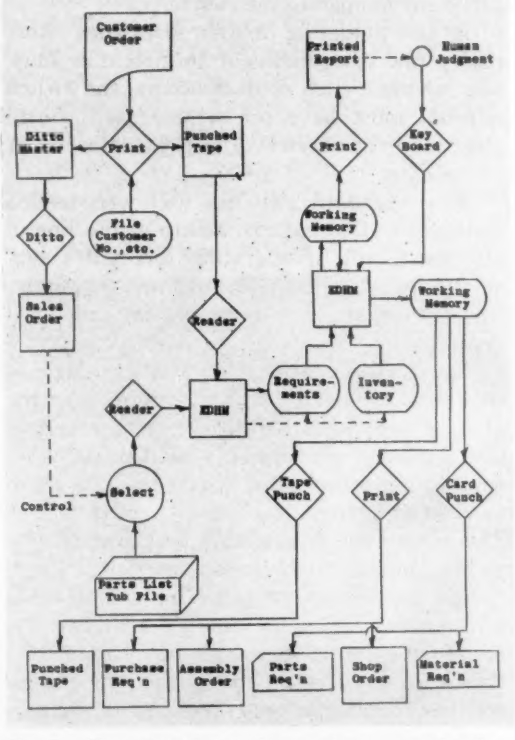


Fig. 1. Flow chart for posting requirements and ordering.

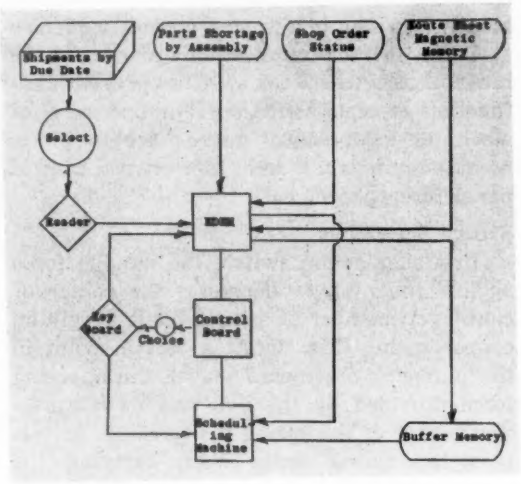


Fig. 2. Flow chart for scheduling control and expediting.

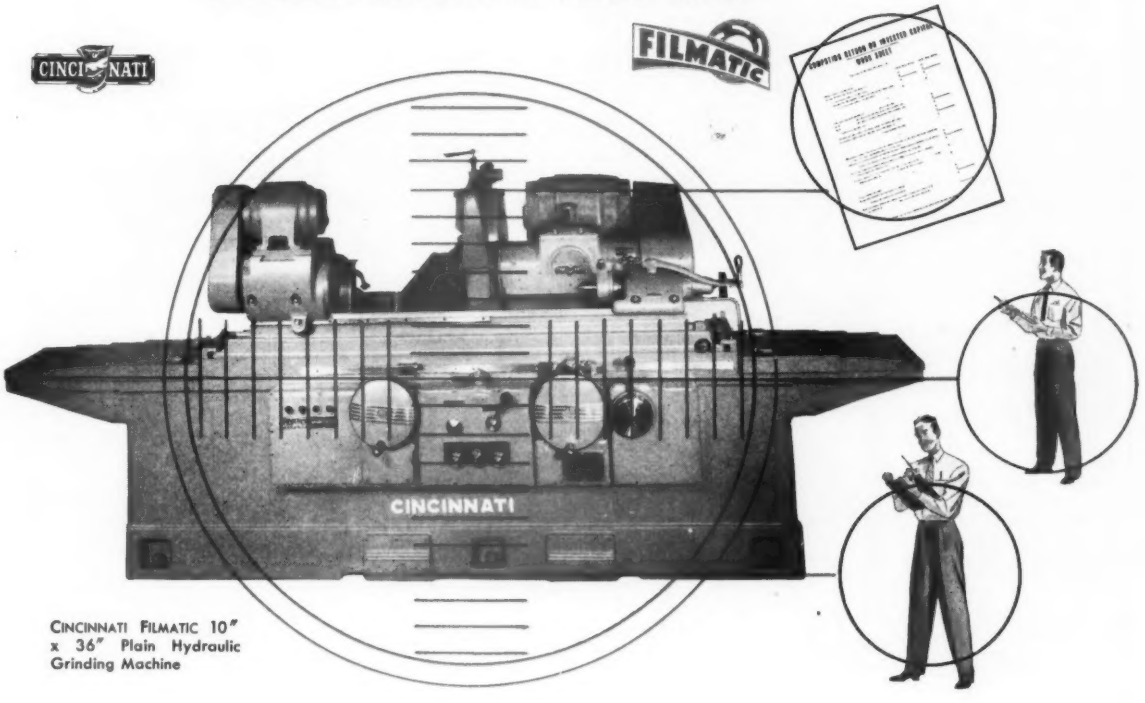
It will be necessary to consider the second of these two points first, the mechanization of the office. One of the major objectives of the Industrial Logistics Research Project[2] is the design of a master scheduling computer which will fulfill the functions of loading and scheduling production operations.

. . . *Continued on page 116*

This article has been adapted for publication from a paper presented at the 1953 Semi-Annual Meeting, The American Society of Mechanical Engineers. The paper was prepared while the author was under contract to the Office of Naval Research, in connection with the Industrial Logistics Research Project at the University of California, and is the subject of that Project's Research Report No. 13.

Any Way You Look at it...

CINCINNATI FILMATIC PLAIN HYDRAULIC GRINDERS REDUCE COSTS IN YOUR SHOP



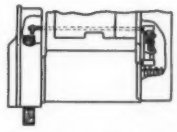
CINCINNATI FILMATIC 10" x 36" Plain Hydraulic Grinding Machine

Look at the spindle bearings, the bed construction, lubrication of ways, electrical controls. Look at everything that effects efficient, low-cost production of precision centertype grinding, and you'll agree that CINCINNATI FILMATIC Plain Hydraulic Grinders have the potential to save a lot of money for your shop. A few ways in which the superior features of CINCINNATI FILMATICS keep costs at a minimum are illustrated at the right.

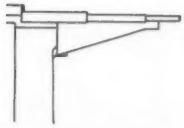
* * * * *

Any way you look at it, CINCINNATI FILMATIC Plain Hydraulic Grinders are the best buy for variety or production centertype grinding operations. It will pay you to replace your old grinders now with new CINCINNATIS. Brief specifications will be found in Sweet's Machine Tool Catalog. You may obtain complete data by writing for literature: No. G-566-2 for the 6" and 10"-L sizes; No. G-603 for the 10" and 14"-L sizes.

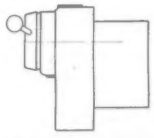
CINCINNATI'S exclusive FILMATIC bearings for the grinding wheel spindle require no adjustment; over 99% have never required service or maintenance.



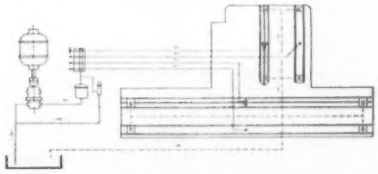
To minimize wheel cost, these machines are equipped with a two-speed device for the grinding wheel.



Sliding covers protect the ways, reduce maintenance costs, increase life span.



Unit construction for principal hydraulic elements cuts maintenance expense.



Automatic filtered lubrication of ways aids greatly in maintaining straight-line traverse and close accuracy for years.

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Model 12-F Hand Tapper
illustrated

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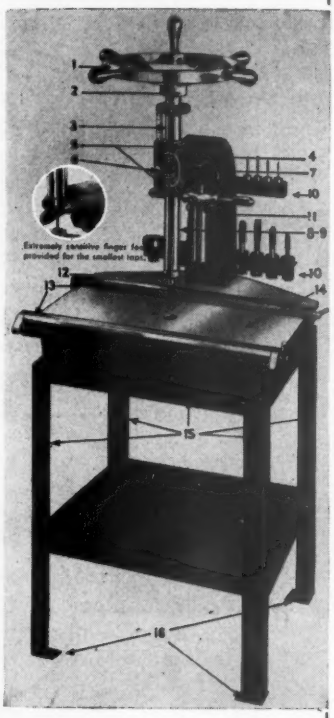
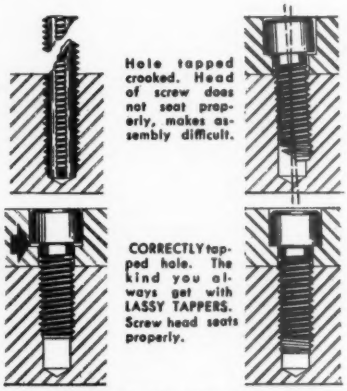
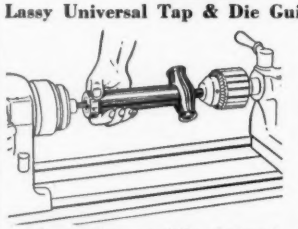


Lassy Depth Gauge

consists of an instantly adjusted gauge ring on the spindle and a scale beside the main bearing. It eliminates guess work, speeds up tapping and prevents broken taps by showing exact depth tap is in work. It also speeds up assembly operations as holes are always tapped to correct depth.


Tap broken by hitting bottom.
Hole tapped crooked. Head of screw does not seat properly, makes assembly difficult.
Incorrectly tapped and hard to spot at assembly. End of screw hits.
CORRECTLY tapped hole. The kind you always get with LASSY TAPPERS. Screw head seats properly.

Lassy Universal Tap & Die Guide *(See No. 11 above)*



This versatile accessory assures good fits and good threads as the tool is always in line. Guide sliding on pin allows taps and dies to follow correct lead. This handy tool is ideal for all lathe tapping and threading. It can be used with power or by hand.

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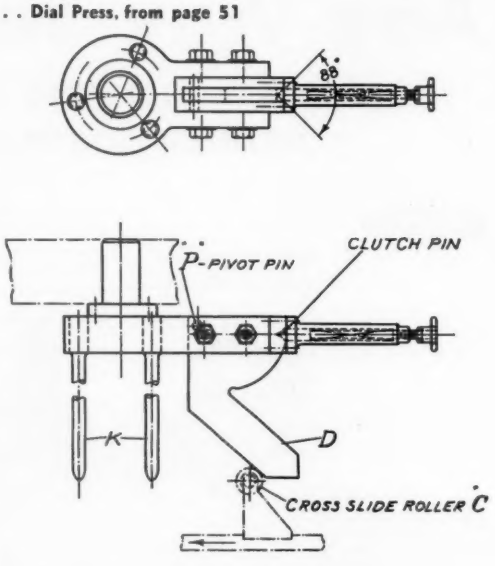
. . . Dial Press, from page 51



INSERTING STATION-PUNCH ASSEMBLY
FIG. 6

permitting shell and punch entry. The shell remains on the die by virtue of the punch spring knockout and ejector pin construction. Attention is called to the adjusting collar "R," Figure 3, used on all dial punches to permit individual height adjustment or setting of each punch to the die as required. High carbon high chrome steel was used for all working punch and die members. Spring pressure was used for drawing and forming at all stations.

At Operation 3, the triangular flange is formed into a channel.

At Operation 4 the channel is formed to an angle of 45 degrees and the dome of the shell is pierced.

At Operation 5 the channel is flattened and swaged to provide the seating surface "S," Figure 1, the dome is reformed, and the lugs are formed to sharp corner to assure proper cap engagement. An interesting feature of this tool is the method of sizing the extreme outside surface of the nozzle lugs. In the non-operating or ram-up position, the upper surfaces of pressure pad "J" and sizing ring "E" are on the same plane due to the action of the die spring pins. On the downstroke, the bottom portion of the ring "E" comes into contact with the base of the lower die first. As the punch continues moving the pressure ring "J" downward, the work is brought within the inside confines of the sizing ring "E." The completed nozzle is transferred to the next station where it drops

. . . *Continued on page 68*

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. . . Precision Switches, from page 61

Fig. 4. A switch used on a dieing machine to prevent machine operation with the inching bar in place.

on small force, but long operating movement, and is often selected for operation off cams. One variation has a roller mounted on the outboard end.

Where actuating forces are greater, a more rigid lever arm is employed. This switch acts in reverse of other switches in that the lever is spring-loaded, thereby holding the plunger in a normally depressed position. A variation of this actuator, with a roller mounted in the outer end of the lever arm, is effective where the actuating force is applied by fast-moving cams or slides.

The rigid lever arm can also be mounted similarly to the leaf actuator, where downward pressure depresses the "pin" plunger. Here, overtravel is provided for by an intermediate leaf spring.

Reset type switches are employed primarily where contact must be sustained after the actuating force has been relieved. A reset plunger must then be depressed to break the contact. The reset plunger is often operated mechanically, but such operation must be by straight line motion.

Repeat Accuracy

Certain types of switches have electrical characteristics permitting them, on small electrical loads, to follow mechanical movements up to 1,800 per minute. On full rated electrical loads, most of the switches are limited to a continuous rate of 300 movements per minute on 60-cycle applications.

Accuracy of repeatability follows in somewhat the same order. Ordinary switches provide accuracy of about 0.0005″ under light electrical load (0.1 amp max.), increasing to 0.005″ under maximum electrical load. Certain switches having wear resistant guides give repeat operation with a variation of plunger operating position no greater than 0.0001″.

Another factor in repeat accuracy is the type of actuator employed. The simplest "pin" plunger switch provides the greatest accuracy, this decreasing progressively as the actuator mechanism becomes less positive in its action.

High sensitivity switches are occasionally advisable but are used only where the actuating means has very limited force at small movement. Actuation may be provided by vapor-filled bellows, pressure-sensitive instruments, and extremely sensitive gaging devices.

Service Life

Although snap action switches have extremely long life, there are enough variables involved that only a **probable** life can be forecast. This will be the point at which the greatest number of switches can be expected to fail under average operating conditions.

The probable **mechanical** life is governed by the average flexure life of the spring. Switches with wider contact separations exhibit a shorter probable mechanical life than switches with more closely spaced contacts. Operating the switch so as to drive the plunger to the limit of its stroke every time will shorten the spring life. Positioning the switch so as to operate at less than full stroke will provide the optimum life.

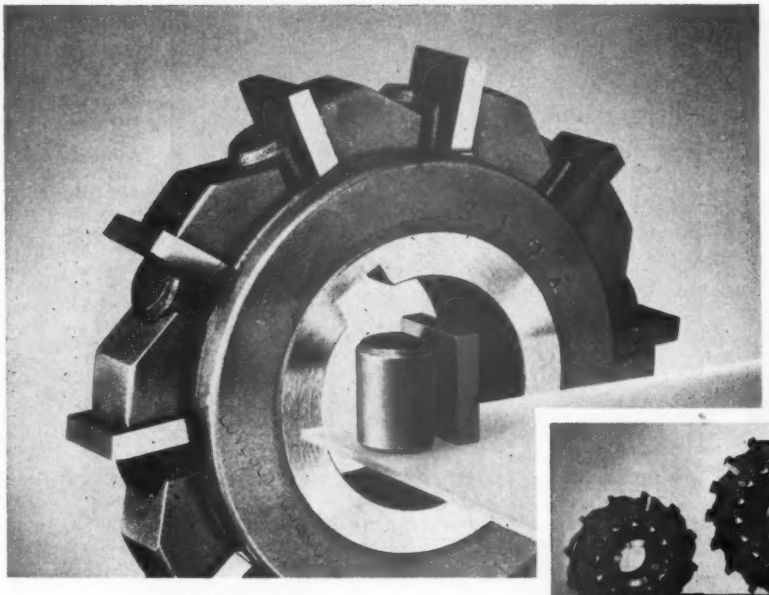
Under full rated electrical load, contacts usually reach their full useful life in somewhat less than the probable mechanical life of the spring system. However, on light electrical loads, the contact life is extended considerably. Because there may be an intermittent sticking of contacts as the ultimate contact life is approached, it is desirable on critical applications to replace switches short of their expected failure.

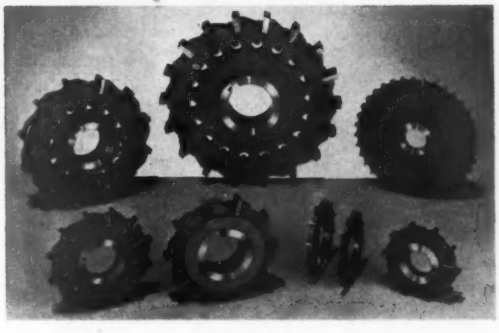
Electrical Considerations

A choice of three circuits can be made in selection of general purpose switches. These are (1) double throw, (2) single throw—normally closed, and (3) single throw—normally open. Most industrial plants stock only the double throw units to provide the greatest interchangeability. The double throw switch becomes either a normally closed or normally open unit merely by elimination of wires to the opposite terminal. These circuits are shown in the lower part of Table I.

. . . *Continued on page 170*

LOVEJOY





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- ★ Only the carbide blades are ground
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- ★ Blades that are standard carbide blanks

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Automation Boosts Production of Shoulder Gears to 240 Per Hour

Basic Machine is Standard "Underpass" Shaver

Even a 6.250-inch flange doesn't slow up production of automotive shoulder gears on an automation equipped "Underpass" gear shaver. One shaved helical shoulder gear every 15 seconds is the pace maintained by this conveyorized setup with fully automatic operation.

The basic machine, Figure 1, is a Model 870 "Underpass" gear shaver built by a Detroit manufacturer and tooled up for fully automatic operation. All the operator has to do is load the hopper; the rest of the cycle, including pre-inspection of gears, is automatic.

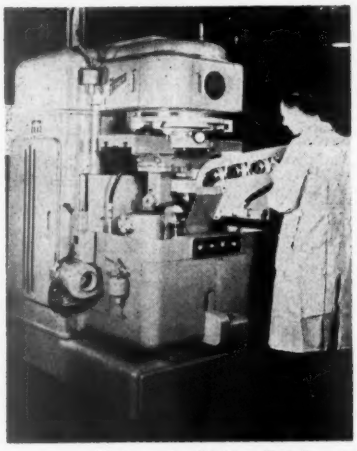


Photo courtesy Michigan Tool Company

Fig. 1. Operator loads hopper of "Underpass" Gear Finisher with shoulder gears. From this point on all steps including pre-inspection and rejection of oversized gears are automatic.

A sizing fixture at the hopper mouth rejects oversize gears, thus providing automatic quality control through the operation.

Gears move down the trough by gravity, Figure 2, until they reach the loading position. Here an air cylinder takes over and feeds the gears into shaving position, one at a time. The shoulder of the incoming gear pushes against the shoulder of the shaved gear, causing the latter to eject at the completion of the shaving cycle. The gear teeth themselves never touch, so there isn't any possibility of damage to the finished gear.

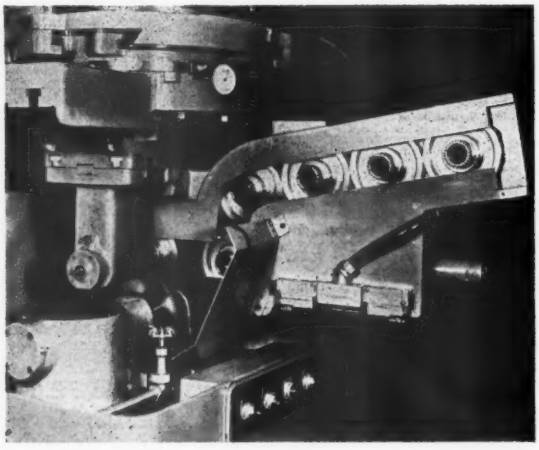


Fig. 2. Closeup of hopper machanism (automatic sizing fixture removed) on automation-equipped "Underpass" Gear Finisher. Air Cylinder at right feeds gears into shaving position one at a time. Air-operated expanding mandrel (not shown) clamps parts into position and holds them during shaving operation.

An air-operated expanding mandrel clamps the incoming gear and holds it during "Underpass" shaving (the fastest known precision shaving method).

Positioning of the gears is apparently so positive that a safety device, provided for automatically ejecting any gear not properly aligned with cutters, has not come into operation at any time during production test runs. Release at the end of the machine cycle is automatic. The 27-tooth helical gears have a 2.0257-inch pitch diameter with a 0.734-inch face width. Normal pressure angle is 18° 30′ with a 17° 49′ 6″ left hand helix angle.

The ejected gear rolls down a trough at the back of the machine and lays over gently, flange down, on a wire mesh conveyor, Figure 3, used to transfer the gear to the next operation. A short guide rail extending beyond the end of the exit trough and the weight of the flange combine to position each gear perfectly on the conveyor. The completed gears move down the length of the wire mesh conveyor and empty onto a parts table to complete the operation.

This high production rate is achieved on a standard Model 870 "Underpass" Gear Finisher. Should the automation-equipped machine be needed for shaving other gears, it may be converted to standard operation by removing the automatic loading mechanism and controls.

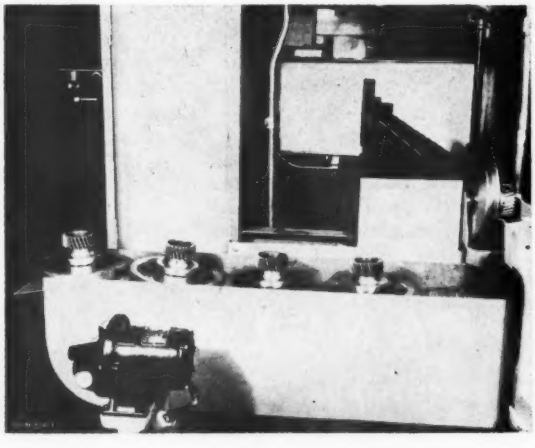


Fig. 3. Finished shaved gears roll down exit trough of the "Underpass" Gear Finisher and are gently layed over, flange side down, on a wire mesh conveyor. Short rail, shown extending beyond edge of trough, and greater weight of the flanged end combine to assure perfect positioning of each part on the conveyor.

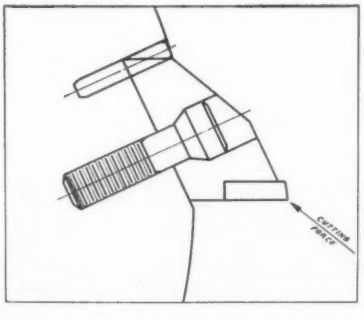
New Attached Blade Milling Cutter

Something entirely new in milling cutter design has been developed to compliment the common solid body and inserted blade type cutters now on the market. This is a new "attached blade" type milling cutter.

Photos courtesy Millit, Inc.

A primary advantage of the Millit attached blade design is its complete blade rigidity. It combines the advantages of the solid body and inserted tooth type cutters by providing a replaceable blade with maximum tooth rigidity or minimum tooth deflection. This rigidity is obtained by seating the replaceable blade on the periphery of the cutter body against a body abutment that takes all cutting forces. The blades are accurately doweled in place at two points. The cap screw shank dowels into a reamed hole to locate the

. . . *Continued on page 66.6*



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A complete "packaged unit" for piston grinding, known as the new 6 x 8" Semiautomatic Piston Grinding Machine, has been announced by a prominent manufacturer.

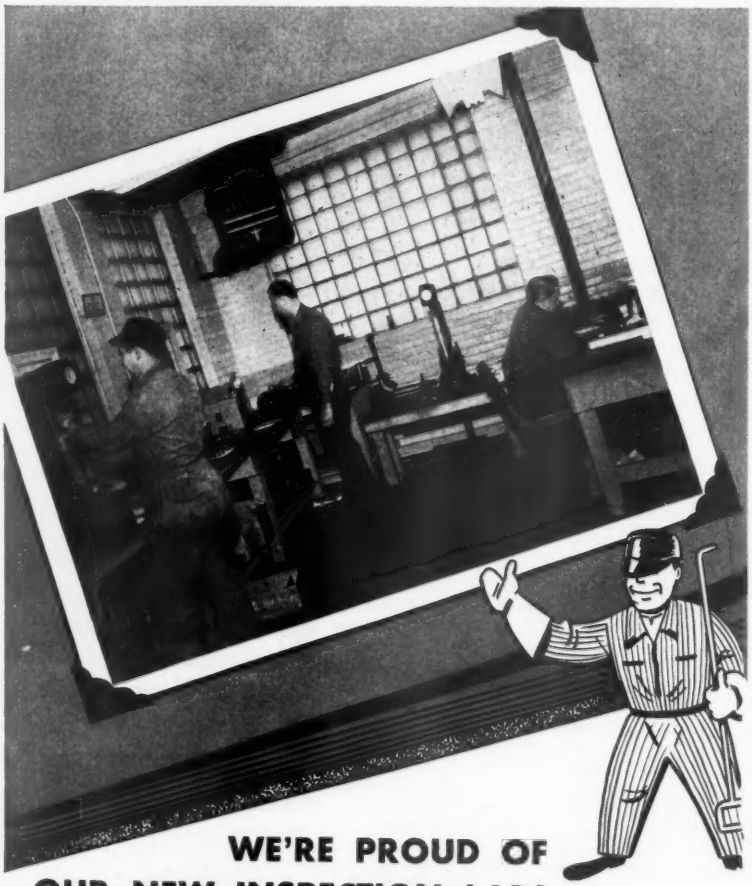
Because of its fast, accurate action, this new machine provides the means for obtaining real economy in grinding elliptical automotive and aircraft type pistons to fine limits of size and finish. The machine can be specially arranged for grinding complex skirts where the degree of relief varies from the top to the bottom of the skirt.

The machine is a heavily built plunge grinder with a time-tested wheel spindle unit and a proved cam generating mechanism of extreme endurance. This mechanism gives the special motion to the workpiece for grinding required skirt form.

Contributing particularly to the productivity of the machine is the fast, precise action obtained from the hydraulically actuated "revolving feed screw" wheel feed mechanism. This provides hydraulic features for rapidly traversing the wheel head, and mechanical micrometer screw feed during the grinding feed stage to assure finest accuracy in sizing.

Very little actual operating effort is required in running the machine. This allows the operator to devote the major portion of his attention to loading and unloading duties. For instance, wheel truing is done automatically by a wheel guard type truing device on the touch of a push button. The automatic grinding cycle is started by movement of a single lever.

For speeding set up and operation, all controls for feeds and speeds are grouped at the operating position on the front of the machine. For simplifying maintenance functions, all pumps, motors, relief valves, and flow control valves, are mounted in accessible locations on the outside of the machine, and electrical controls are compactly grouped in an elevated enclosure.



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The General Metal Products Co., St. Louis, purchased an "Iron Lung," informally named because of its resemblance to

. . . *Continued on page 66.6*

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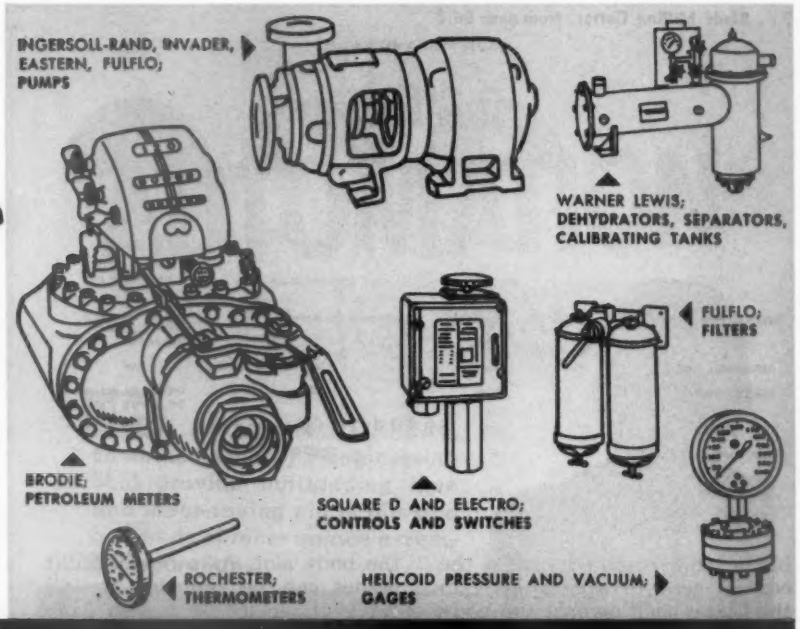
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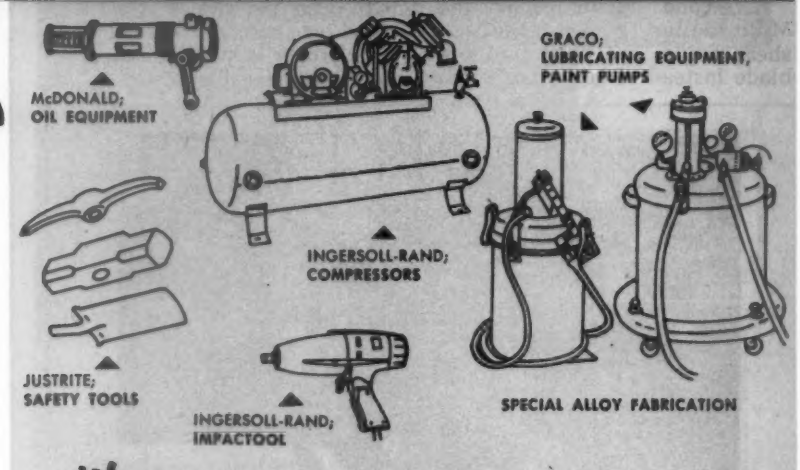

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TOOL DIVISION: Drills, Taps, Carbide Tools, Rotary Files, Air Cylinders, Valves and Controls, Machinery and Equipment.

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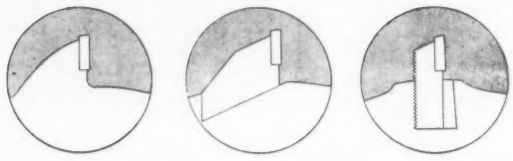
SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

. . . Blade Milling Cutter, from page 66.3

MILLING CUTTER COMPARISON CHART



	SOLID BODY	ATTACHED BLADE	INSERTED BLADE
INITIAL COST	Low	Intermediate	Depends on design, generally, most expensive
REPLACEMENT COST	High	Low	Low
BLADE RIGIDITY	High	High	Depends on design, but always least
BODY STRENGTH	Low	High	High
SIZE ADJUSTABLE	No	No	Yes
CHANGEABLE RAKE ANGLES (to cut different materials)	No	Yes	No
CHANGEABLE CUTTING TIP (H.S.S., Cast Alloy, Carbide)	No	Yes	Yes

blade and combines with the conical seat to accurately cam the blade back against the body abutment. A dowel through the body abutment holds a slot in the tail of the blade and accurately locates the tail laterally.

A second advantage of the Millit design is that rake and shear angles are built into the blade instead of being built into the body slot. As a result Millit bodies can be rebladed for all types of service. A change from stagger tooth construction to side mill construction is accomplished by a quick change of blades. Blades are also available with customer choice of carbide, H.S.S. or cast alloy tips, each with proper rake angles built into the replaceable blades.

at Lakeside Steel Improvement

BAR STOCK HEAT TREATING & STRAIGHTENING is fast, accurate and meets the most critical specifications

Why wait?—Ship your bar stock to Lakeside for straightening and heat treating. Get a custom job with no delays. Our facilities are ample to handle large tonnages of round, square, flat and hexagon bars.

¼" to 10" O.D. and up to 20' in length are handled quickly and easily. Hardening and drawing furnaces, together with quenching tanks for batch heat treating bars and carbon, alloy and stainless steels. Write or wire for quotation now!

Our Services: Electronic Induction Hardening, Carbonitriding, Flame Hardening, Heat Treating, Bar Stock Treating and Straightening (mill lengths and sizes), Annealing, Stress Relieving, Normalizing, Pack, Gas or Liquid Carburizing, Nitriding, Speed Nitriding, Aerocasing, Chapmanizing, Cyaniding, Sand Blasting, Laboratory Physical Testing.

THE Lakeside Steel Improvement Co.

5418 LAKESIDE AVE., CLEVELAND 14, OHIO HENDERSON 1-9100

METAL TREATING INSTITUTE

. . . Iron Lung, from page 66.4

units used for infantile paralysis patients, to cure their patients—baskets of partially completed deep-drawn stainless steel stampings of the type 305, 18-8. This furnace is also used to heat treat stainless steels in the 400 series. The unit is a full muffle, gas fired hydrogen atmosphere furnace with a water-jacketed cooling chamber.

Doctor's reports from this plant showed an immediate improvement in the color of the patients, each stamping emerging from the "Iron Lung" treatment bright and scale free with their original sparkling finish.

SAFETY

The highway accident death toll in America has reached dreadful proportions, exceeding in a year's time casualties from the Korean battlefront. Holiday weekend traffic tragedies have been particularly serious. In an all-out effort to do its part in promoting safety on the nation's highways, The Timken Roller Bearing Company has curtailed all inbound and outbound truck traffic between its various plants, to customers, and from suppliers, between midnight, Friday, and midnight Sunday. Only in extreme emergencies, when customers' production schedules would be seriously affected, are exceptions made to this rule of no weekend truck shipping.

From May 30 through June 30, the first month of the new safety program, 1816 truck loads were shipped with only five shipments made over the weekends. A total of 249 truck loads were not shipped over weekends during June which normally would have gone out. The Timken Roller Bearing Company, since inaugurating this safety program, has received excellent cooperation from the many trucking firms hauling for the company, and from the many Timken Company customers. Production schedules have been unimpaired, and bearing orders have flowed smoothly.

Both public and company officials are hopeful that other industries in Ohio and other states will follow the lead of the Timken Company in promoting highway safety.

Talk of the Month

By Henry F. Dever, President
BROWN INSTRUMENT DIVISION
MINNEAPOLIS-HONEYWELL
REGULATOR CO.

Our firm, the largest in the field of automatic control and industrial instrumentation, makes several thousand measuring, indicating, recording and controlling devices. These range from your living room thermostat to autopilots for bombers, jets and helicopters, and sensitive radiation pyrometers which measure the temperature of molten steel to determine its ultimate quality.

To explain what is meant by "industrial instrumentation," let's take a simple problem in automatic control. Let's say we want to keep the temperature in a house between 70° and 72° F. Here is our control sequence. We set the thermostat for 72°. It will measure the temperature, and should it fall below 70°, it will send a signal to the burner, through its relays, and ask for more heat. As the heat from the flame passes into the air in the room, the thermostat still measures the temperature. When 72° is reached, it signals the burner to stop.

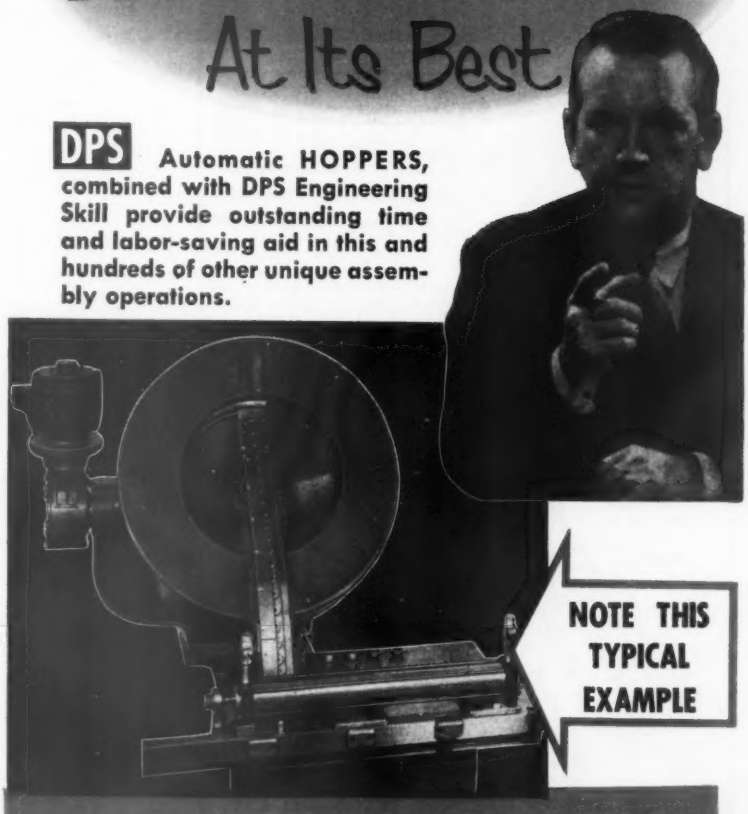
In that simple sequence we have automatic control. We

. . . *Continued on page 72*

Editor's Note: "How Automatic Can We Get" was a talk given by Mr. Dever before the Boston Society of Security Analysts. It was so pertinent to several of the editorial features in this issue of TOOLING and PRODUCTION that we obtained permission to reproduce these excerpts from it.

Here's AUTOMATION At Its Best

DPS Automatic HOPPERS, combined with DPS Engineering Skill provide outstanding time and labor-saving aid in this and hundreds of other unique assembly operations.



NOTE THIS TYPICAL EXAMPLE

Above is shown motorized hopper and transfer mechanism whereby eight (8) valve retainers are selected, oriented and transferred out to proper spacing and dropped over eight (8) valve stems simultaneously, and BELIEVE IT OR NOT, ALL THIS IN ONLY FOUR SECONDS! . . . This unit is used as a part of a special machine developed for the semi-automatic assembly of valves in V-8 MOTORS . . . just one of innumerable applications where DPS Motorized Hoppers, Power Screwdrivers and other Assembly Aids are conserving valuable production time in thousands of plants.

GET THE FACTS—WRITE TODAY
LESS WASTE TIME, LESS LABOR, LESS COST!

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2827 W. FORT ST. DETROIT 16, MICH.

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PRODUCTION TOOLS

Adjustable MULTI-DRILL

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- Drill 2 to 8 Holes at 1 Stroke
- Fits Any Drill Press

Increase production up to 800%—save time, cut costs. Mounted without alterations or special tools. 9" drilling area; centers to ½". Extension Spindles available to increase area to 22½". Special adaptations available.

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Commander TAPPER

- Wider Range...1 Tapper Handles #0 to ¾" Taps
- Automatic Tap Protection
- Furnished to Fit Any Drill Press

Adjustable full range torque control instantly stops any tap when it's dull, loaded, strikes a hard spot, or bottoms in blind hole tapping. Assures maximum production, cuts rejects, even with inexperienced operators.

SELECT A SPINDLE

- Drills, Reams, Taps on 1 Drill Press Spindle
- Increases Production • Improves Accuracy
- Reduces Costs • Can be Used on Any Drill Press

Save time, reduce handling with a Commander SELECT-A-SPINDLE Dual Speed Turret Head. Speed selection on each spindle permits tapping, drilling, reaming at recommended speed. Taps on 1, 2 or all 3 spindles Positive indexing of head without stopping motor. Ruggedly built for high production work.

Write FOR CATALOG #851
and the name of your nearby Commander Distributor

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CHICAGO 24, ILLINOIS

. . . Dial Press, from page 64

through a hole in the bolster plate and into a carton.

The operator merely loads the hopper, inspects parts periodically with gages, and watches the machine to see that it functions normally. Safety devices are provided at each operating station to stop the machine automatically in the event of improper ejection or entry of the work. Average production for an eight hour period is approximately 55,000 nozzles per day.

If the design of the product and its requirements justify the capital investment, the opportunity for low cost manufacture and flexibility of operation offered by this type of equipment and tooling are limited only by the ingenuity of the Tool Engineer and the resourcefulness and skill of the man in the shop.

. . . Counters, from page 47

versatile supervisory tools are earning their keep, examples which may stimulate your thinking as you survey your shop:

In steel mills, predetermined counters control both the length and batching of strip and plate stock.

In the zipper industry, completely automatic machines form and apply the zipper teeth, and predetermined counters provide exact control of the number of the teeth and the length of clear tape between zippers since they are made in continuous strip.

Next Month - 6th Annual QUALITY CONTROL Feature issue

In the pharmaceutical industry, they count precise quantities of pills and capsules at rates of thousands a minute and check code marks on labels to assure correct packing.

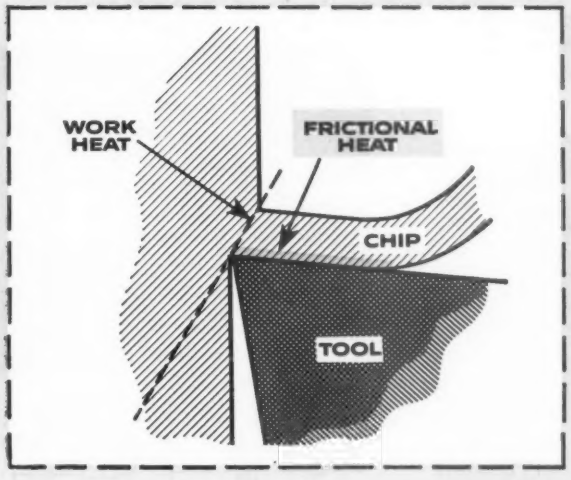
In the bottling business, caps are counted errorlessly as they are packed for delivery. No overcount or undercount means satisfied customers without "baker's dozen" losses.

In electronics, small parts too fragile to be handled and too small to be weighed are counted photo-electrically, batched and sorted automatically.

Deciding whether you need electronic counting is simple. If you must control speed, quantity, length, weight, or volume there is an electronic predetermined counter which will provide the answer. And, if you must control these things precisely, it is probable that predetermined counting will provide the only answer.

JOHNSON'S WAX-COOL ATTACKS FRICTIONAL HEAT

New water-soluble coolant effectively lubricates at tool-chip interface.



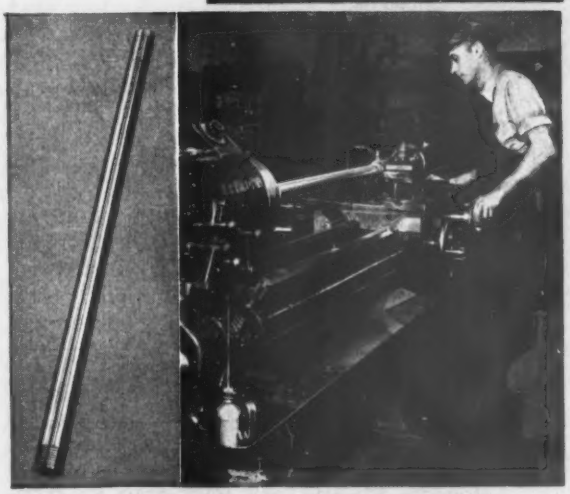
1. WAX-COOL stays with tools and material even at temperatures up to 450°E and pressures up to 200,000 P.S.I.

2. WAX-COOL prevents chip weld because work runs cooler.

3. WAX-COOL effectively minimizes frictional heat which is by far the principal source of heat.

Because of the greater lubricity of certain waxes and their high polar attraction for metal, Wax-Cool is the first coolant to greatly reduce frictional heat at the tool-chip interface. Wax-Cool also has the heat carry-off properties of ordinary coolants—to check work heat generated in the shearing zone.

HERE IS PROOF!



Wax-Cool is being used effectively on this tough job at the E. J. Longyear Company, Minneapolis. They are turning down the external surface of a 4'6" length of #2320 steel tubing. One rough and one finish cut. On a 15-piece run it took 3 days with 4 pieces of scrap, and a poor finish. With Wax-Cool the job was done in 2 days with no scrap and a mirror finish. They used to cut halfway and reverse the tube in the lathe. Now they cut its full length for a straight, accurate cut.

Wax-Cool created these savings

One day saved on a job that used to take 3 days
No scrap
Mirror finish right from the lathe
Tool life doubled
No hot chips to handle

A test is your best proof

See for yourself how Johnson's Wax-Cool can give you economy and performance you never dreamed possible. Real savings in tools and time make Wax-Cool inexpensive to use. Call your local Johnson distributor, or write to:

INDUSTRIAL PRODUCTS DEPT. TP-9
S. C. JOHNSON & SON, INC., RACINE, WISCONSIN

Ask about Wax-Cut—*wax-type cutting oil for automatic screw machines, gear cutting machines, etc.*

Ask about Wax-Draw—*wax lubricant for drawing and forming all types of metals.*

. . . Automatic Cycling, from page 43

One level should be used to select pilot lights to indicate in which position the switch is resting, since the position numbering is not as clear as on the type 45.

The switch cannot rotate backward, so for resetting it must advance to the next starting position. Two connections are available for this purpose. The coil may be energized through the off-normal spring which opens in the starting position. The other method is to strap all the contacts in one level and connect them in series with the coil. If self-interruption is used, resetting requires only a fraction of a second, because this switch can step 80 times per second.

The Avey Drilling Machine Company first used this equipment on two machines when conventional control would have been impractical because of size and cost. Figure 6 shows a machine used to produce a military item—a ring with 15 equally spaced holes that are drilled radially, milled with two cross slots per hole, back countersunk, and tapped. A fifteen station index table is used to rotate the part. A portion of the circuit is shown in Figure 7.

As the table rotates to the first station, a cam momentarily closes a limit switch to step the type 44 switch to the first position. When the table stops, a timer operates relay CRU for about three seconds to start the drilling unit. At the end of the drilling the table automatically advances one station and another hole is drilled. During the fourth index, a second cam operates the limit switch to step the type 44 to the second position, at which time the first milling unit is energized. This continues, and each time the first hole reaches a unit a cam steps the switch one position. When the first hole returns to the drilling unit, all holes have been drilled, and the switch is stepped to position 6 where the driller is not energized. As each operation is completed, the stepping switch removes that unit from energization. When the last hole has been tapped, the switch is stepped by the next index to position 10 which rotates the table to the starting position.

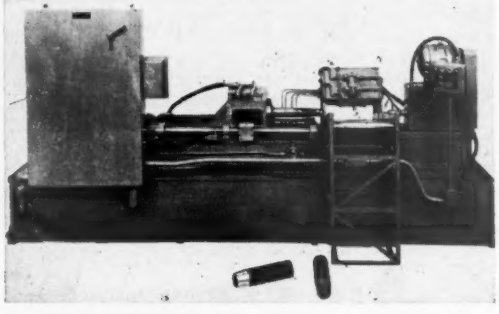


Fig. 8. This shell-centering machine has a complex sequence of operations, and is, in reality, a closed-loop non-balancing servomechanism.

A limit switch that is closed only in the starting position of the table, and the off-normal contact of the stepping switch, are closed in series to the "cycle start" button. This automatically insures that the table and switch are synchronized at the beginning of each cycle.

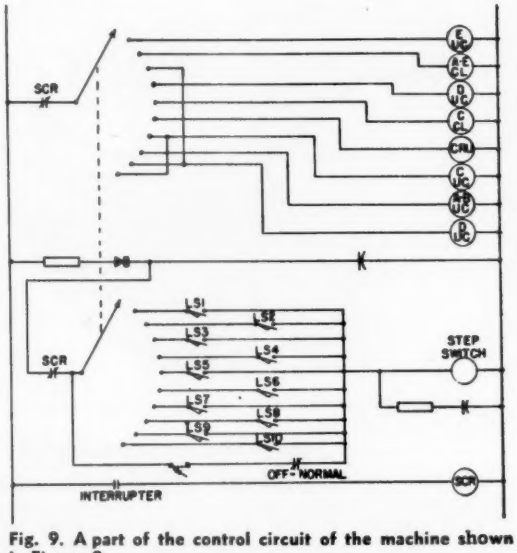


Fig. 9. A part of the control circuit of the machine shown in Figure 8.

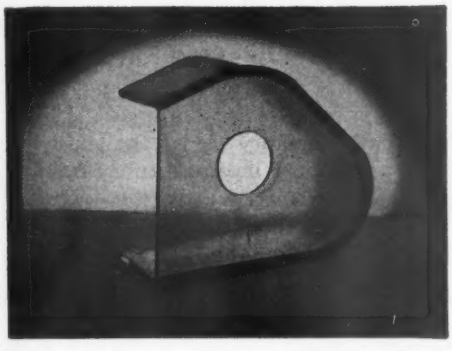
Figure 8 shows a shell centering machine that has a more complex sequence of operations. There are five hydraulic cylinders which move, position, and clamp the part. At the end of their operation, these cylinders operate limit switches which signal the stepping switch that a motion has been completed and that a new operation may be initiated. This machine is, in reality, a closed-loop non-balancing servo-mechanism. Part of the control circuit is shown in Figure 9.

Another telephone-type industrial relay is used to advantage in this circuit as relay SCR. In a-c form it is designated type FMS by Automatic Electric, and type AMS by C. P. Clare & Company. It has one or two microswitches mounted on it for contacts, but the coil requires only a few volt-amperes to operate which, in this case, saves the interrupter contacts. The interrupter operates the step control relay SCR which opens the step switch

. . . Continued on page 165

Setting blocks for vacuum forming of thermoplastic sheets. Resin #77 is resistant to heat, will not crack or distort.

Cast stretch-die used in forming aluminum aircraft parts. The high compressive strength of Marblette's resin #71 makes it particularly adaptable to this operation.



Transparent gear housing cast from Marblette phenolic resin #88 demonstrates the excellent light transmitting properties of the Marblette compound.

The stylus of the pantograph is moved over the contours of the pattern, made of Marblette resin #71, reproducing it with complete accuracy in the multiple cavity steel die in the background.

This picture page shows Marblette's Phenolic Casting Resins at work for Tool and Die Men and Foundry Men who believe sound economics make the best foundation for lasting profits.

At Marblette you'll find one of America's most versatile groups of specialists in phenolic resins. And around these men, in the last 25 years, Marblette has built up the special equipment specialists must have in order to provide you with the special liquid phenolic resin necessary to meet your specific production requirements. The Marblette Corporation, Long Island City 1, N. Y.

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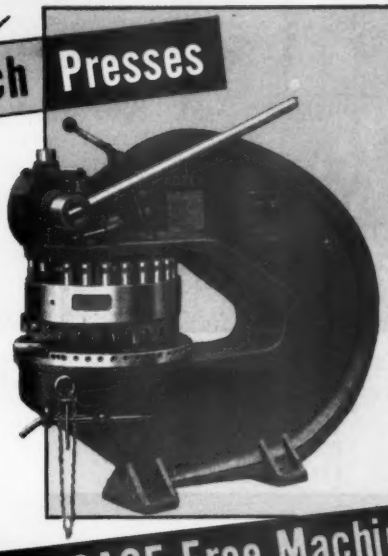
Rotex Punch Presses

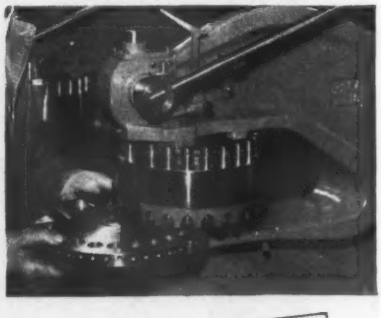


Have SPEED CASE Free Machining Plate Steel Die Turret Plate

SPEED CASE (X1515) low carbon, open hearth, steel plate has won the favor of numerous manufacturers of machine tools, because of its machinability, ease of finishing and response to various case hardening methods.

Typical is Rotex Punch Co., Oakland, Calif., who adopted SPEED CASE for the die turret plate on their versatile presses. They report ease of machining, longer tool life and negligible distortion in heat treating.

The die turret plate retains the dies which are readily removed and replaced. At a flick of the wrist a different size punch can be brought into position. The turret die plate is then rotated to the desired position and locked in place. Rotex "Quick Change" Punch Presses are widely used in sheet metal, fiberboard, plastic and other fabricating plants. Punches and dies may be round, square or other shapes. SPEED CASE has ideal physical properties for this application. Perhaps it can save time, cut costs on your equipment. Send for facts.



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Produced by W. J. Holliday & Co., Inc., Speed Steel Plate Division, Hammond, Indiana. Plants: Hammond and Indianapolis, Indiana

. . . Month's Talk, from page 67

measure a result and, as limits are reached, we feed back our intelligence and cause an action to correct any error our measurement finds. The ramifications of that theme are terrific, but basically that's automatic control. In industry, it is known as "industrial instrumentation."

The full potentialities of automatic control in industry, or industrial instrumentation, will not be reached as long as we think only in terms of putting controls on individual industrial machines—or even of putting several such machines embodying controls into factories. The entire factory—even the entire process of manufacture from field or mine to consumer—must be engineered for control. Our aim in automation is the greatest satisfaction from the least expenditure of human effort. At the target end of our outlook is something which we rather loosely call the automatic factory.

How "automatic" are we now?

How much automation have we accomplished already in comparison with what there is yet ahead of us? I know of no authoritative statistics that can tell us very accurately what part of our instrumentation potential has been reached. But as I see it, we are only nicely started. We may be in the neighborhood of 10 to 20 per cent along the way. Statistics which our company collects to guide our plans indicate that sales of automatic recording and controlling equipment alone represented about 1 to 3 per cent of capital expenditures for machinery and equipment prior to World War II. The war, however, taught management the value of instrumentation. It stimulated development and improved technology. As a result, during the last few years, our types of instruments have represented about 7 to 8 per cent of the capital expenditures for equipment in industrial plants.

We can reason that still further education of both present and prospective users of instruments can expand this potential to 10 per cent. Then, if we attempt to evaluate what improved technology can do over the years to make instruments more usable, more valuable, more indispensable, we can see that it is within reason to expect that some day the investment in instruments will rise to 15 per cent of such capital expenditures. And that percentage would be applied to much larger expenditures as the economy grows.

The last ten years have seen enormous growth in industrial instrumentation. The rates of expenditures for measuring and control instruments (the best index available for determining how far automation has gone) have increased twice as fast in the last 15 years as capital expenditures as a whole.

Furthermore, by 1955, sales of these same types of instruments will have doubled purchases of 1950. This follows a pattern of increasing volume which indicates that since 1930 annual sales have multiplied by some 10 times.

Who uses automatic controls?

Of the nation's 250,000-odd manufacturing firms, some 65,000 buy 80 per cent of the industrial instruments produced. Of this number, 25,000 represent new users since the start of the Korean War. This, obviously, leaves at least 185,000 firms yet to incorporate automatic control equipment in their manufacturing operations.

It's true, of course, that the war accelerated development of electronics stimulated the instrument industry. However, it would be a mistake to assign too big a role in the growth of control instrumentation to direct war spending. The war-born materials and labor shortages of the past decade are also one basic cause of more instrumentation. Another is the growing need, in meeting the demands of new products and processes, to do things that couldn't be done with manpower at all—even if the manpower were available.

There are plenty of directions in which to extend our present frontiers of technology. There

. . . *Continued on page 74*

• Singly or in production lines, three Zagar broaching machines broach small and medium size parts with eye-opening speed and accuracy. Profitable uses: keyways in gears, hubs and pulleys; hexes, squares and irregular holes; sizing holes to close tolerances. Simple, fast, easy to learn; costs little to buy, little to operate. May we study your needs?

Write for Engineering Manual "T-9"

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

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24000 LAKELAND BLVD.
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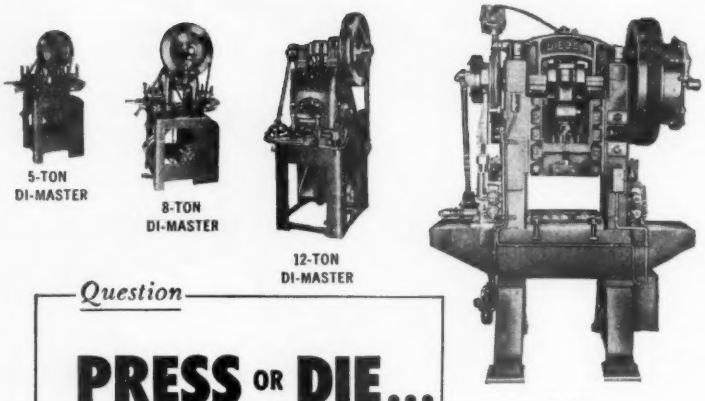

Question

PRESS OR DIE... which is more vital ?...

Answer—

For automatic operation, press and die are of equal importance and should be regarded as an integral unit.

When considering presses, as much thought should be given to their precision accuracy as to that of the die.

Choose presses that . . .

- Guarantee maximum die production.
- Assure longer die life.
- Afford maximum die protection.
- Minimize costly down-time.

Investigate

DIEBEL

Precision-Built Automatic

PRESSES

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Di Machine Corporation 2708 W. IRVING PARK ROAD CHICAGO 18, ILLINOIS

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. . . Month's Talk, from page 73

are many areas which, currently, we reach feebly—if at all. There are many areas beyond our present familiar industrial processes which one day we must make automatic. Our future, then, poses a technological rather than a sales or merchandizing approach.

Technology is both our hope and our problem. How fast can we do these many challenging tasks? How fast can we engineer the products and applications that are and will be demanded? As usual, economics enters the picture, for even technology gets down to men and money, among other things. The point is that we look out on a vista of instrumentation problems crying to be solved—not upon a mature and stable situation in which technology has little or no place to go. Even the newest technology will have to be expanded manyfold to make our visions come true. It is not only possible but imperative that we develop the full potential of automatic control.

Meanwhile, the unceasing demand for more and more exacting control places unrelenting pressure on engineering talent. Technology itself struggles with economics and education to perfect a proper balance between income and engineering expenditure. If the visibility into the future were greater, and we could select exact avenues of approach, much time and money would be saved. But the visibility is far from perfect!

Your advance planning is imperative!

In looking into the future, one should see clearly the great emphasis we must put on advance planning—on the best possible selection of equipment, including instrumentation, at all points in the manufacturing operation. At Honeywell we call this concept system engineering. We consider it to be a joint responsibility of the user, the contracting engineer and the equipment manufacturer.

As of today, the process industries—the petroleum, the chemical and metal industries—generally represent the most effective effort in the use of this system concept. Yet it is still far from clear as to how the responsibility for it will be or should be divided among the parties at interest.

All have a stake in the matter. But there are still wide differences among the users, engineers and manufacturers, concerning both willingness and ability to perform system engineering.

Actually, much automation is now as close as the nearest instrument engineer and master mechanic. Much technology is also lying there ready to use. Still the system engineering approach remains at an immature stage, particularly at the financial or management level. Management, conditioned to traditional ratios of expenditures, has yet to recognize fully that system engineering justifies its cost. Management is quite used to hiring certain kinds of engineering talent — architects, researchers, consultants of various kinds and, often, industrial specialists. Today, however, there are a limited number of qualified process and instrument consultants or engineering contractors and trained instrument staffs available to solve the systems engineering problems of industry. Generally, such asistance is used only on the larger and more complex processes. We must, it seems to me, expand the available knowledge more rapidly. One way to do this is to have management understand more about what instrumentation can do. This will, in turn, stimulate the need and provide the money to make such talent more widely available.

Instruments promote efficiency, cut costs

I mentioned earlier the effect of war-born shortages of material and labor as having a large tailwind effect on instrumentation. A prime example can be found in an industry which had its American beginnings in New England and whose financing is still a major New England activity. I refer to the paper industry. Between 1939 and 1945 a part of the newsprint industry increased production from a little less than four million tons a year to about six million tons. This was done not just by building new mills, nor even by installing new papermaking machines, which couldn't be had in most of that period because of war priorities. Putting on new men, except in the woods crews, was also impracticable because

. . . *Continued on page 90*

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Photos courtesy Colonial Broach Company

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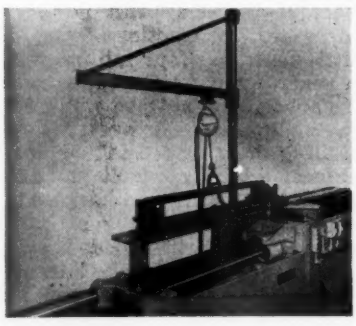
. . . *Continued on page 98*



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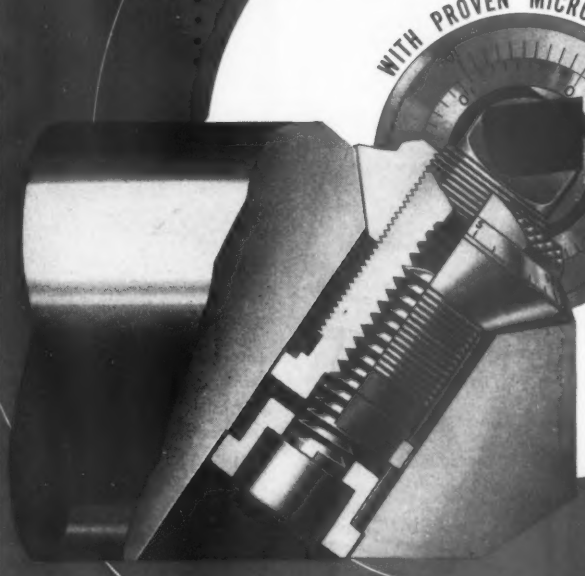

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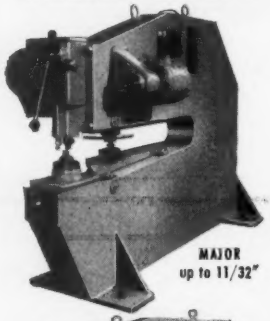

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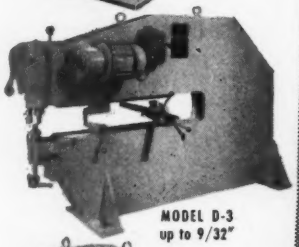
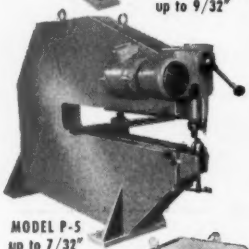


MODEL D-3 up to 9/32"



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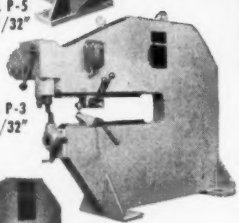

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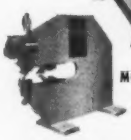

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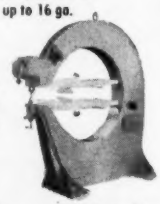

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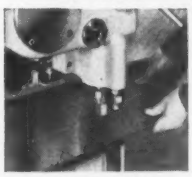
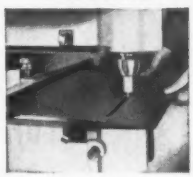


STRAIGHT CUTTING



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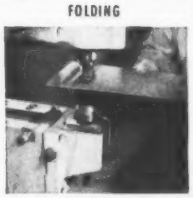

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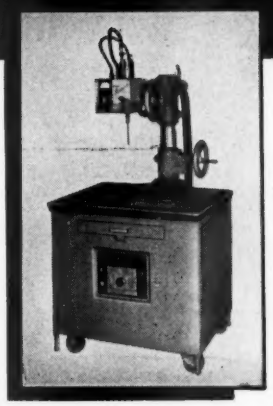

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One solution of this maintenance problem is the use of stainless steel wire inserts. These wire thread inserts provide higher

Photos courtesy Heli-Coil Corporation

Fig. 1. Stainless steel wire thread insert fits into tapped hole in the bearing housing. The hole at the top of the housing has already been protected with an insert.

loading strengths in all materials and are more resistant to wear, vibration, seizing, galling, and corrosion than original threads.

While a total of more than 75 inserts is applied in one jet engine, a specific example will serve to illustrate the benefits achieved.

. . . Continued on page 98

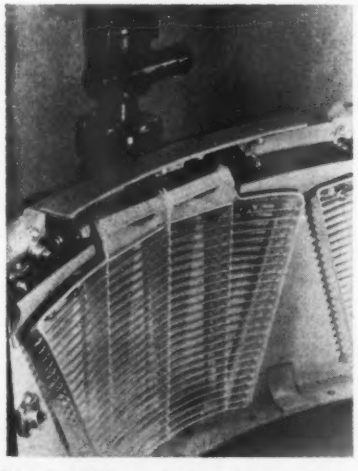

Fig. 2. This air inlet screen on a jet engine pivots on a shaft which revolves in ball bearing pillow blocks.

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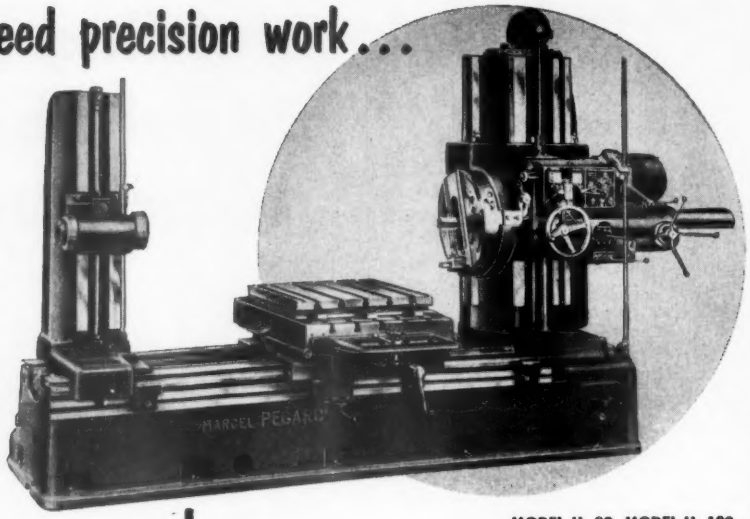

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Spindle traverse	31 13/32"	39 3/8"
Spindle speeds	18	18
Facinghead speeds	6	9
Long. traverse of table	51 3/16"	63"
Motor	7 HP	13½

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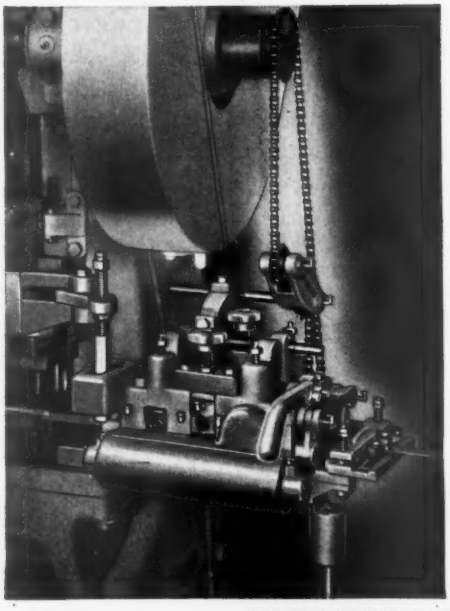

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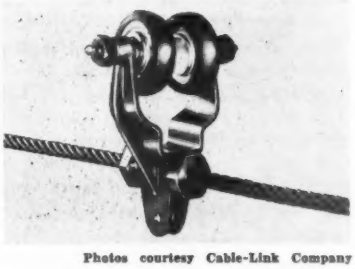
"Cable-Link" Cable Conveyor System

The development of a new type cable conveyor system has been announced by the president of a Detroit manufacturer.

This development is based on the use of improved plow steel cable, cut in lengths of 16", 24", and 32" with steel buttons swedged on both ends which are



Photos courtesy Cable-Link Company

Fig. 1. A standard trolley assembly is made up of two malleable brackets and two traction wheels. The two brackets are held together by nuts threaded on the tapered "sleeves" of the bracket.

called "cable-links."

The trolley assembly of this system is shown in Figure 1. It is made up of two malleable steel brackets and two traction wheels. One half of an assembly is shown in Figure 2. The swedged-button ends of the "cable-links" recess in the cavities of the brackets, thus enveloping the ends of the "cable-links." Steel nuts are threaded on the tapered "sleeves" of the brackets, thereby exerting pres-

. . . *Continued on page 85*

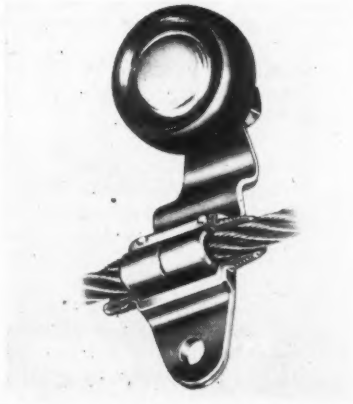


Fig. 2. One bracket is shown with the cable button set in the bracket cavity. The threaded tapered bracket sleeve is shown.

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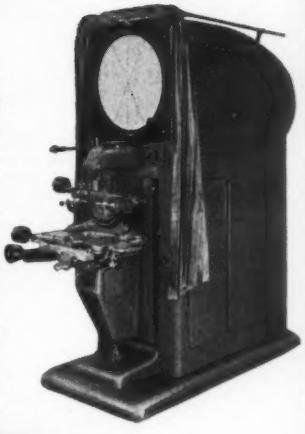

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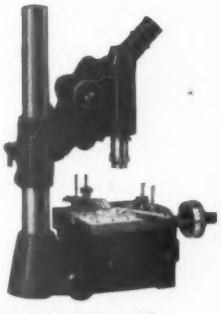

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Conventional Crowning Added To Shaving Machine

Gear tooth crowning by the conventional method of rocking the machine table during the shaving cycle is a feature that has just been added to the Red Ring Model GCU shaving machine by a new redesign.

Heretofore, crowning on this machine required a specially formed cutter, but now it can be done with any standard rotary cutter while the work gear is being reciprocated in line with its axis.

The rocking action of the table is accomplished by means of a central pivot and a cam which causes each end of the

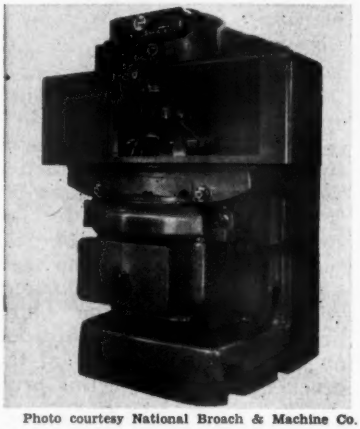

Photo courtesy National Broach & Machine Co.

Fig. 1 Red Ring Gear Shaving Machine, Model GCU equipped for gear tooth crowning and differential automatic upfeed.

table to rise slightly as the end of the cutting stroke is approached.

The table has also been made considerably more rigid and the crowning cam located on table centerline to avoid any twist.

The point of maximum crown, although usually at the center of the tooth may be shifted either way by changing the position of the work gear with reference to that of the cutter. The amount of crown is a function of the cam adjustment.

When it is desired to shave gear teeth, spur or helical with-

. . . Continued on page 99

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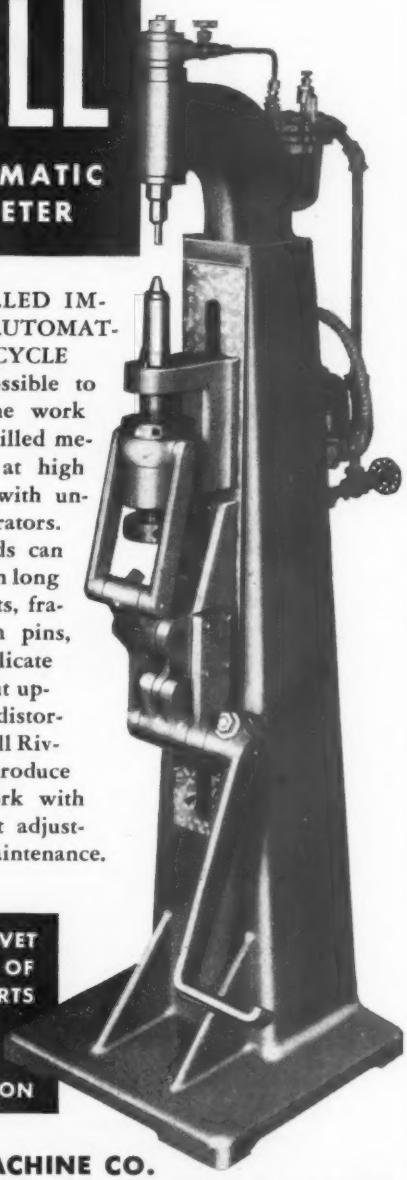

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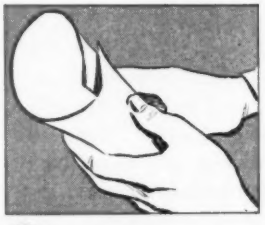
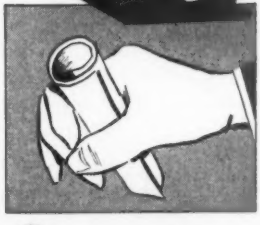
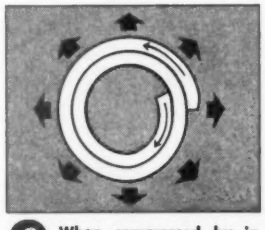


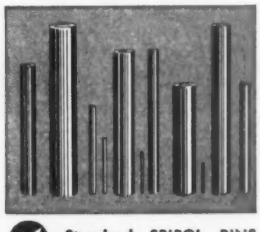
1 Roll a piece of paper spirally into a double coil. This is the way SPIROL PINS are rolled of steel or other flexible materials.



2 Compress roll and insert into circle of thumb and forefinger. Note "live action" as it expands to lock itself in circle. This is the SPIROL PIN principle.



3 When compressed by insertion, SPIROL PIN immediately develops *evenly distributed* radial tension, holding it firmly in place.



4 Standard SPIROL PINS from 1/32" to 1/2" diameters, and 1/8" to 4" lengths. Non-standard diameters, lengths & materials available on order.

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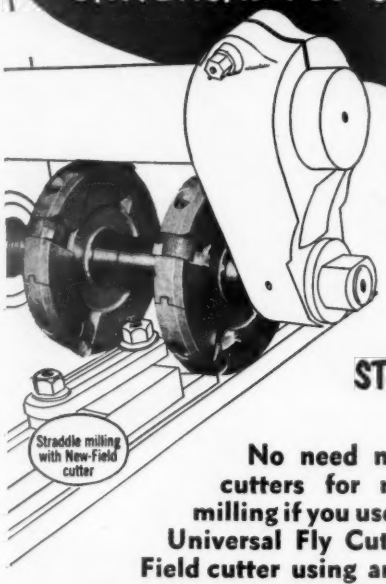
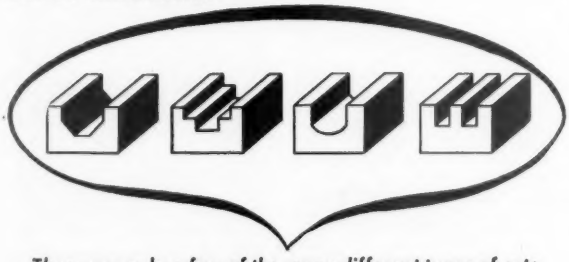
UNIVERSAL FLY CUTTER



MAKES 4-6 CUTS IN ONE OPERATION!

USES STANDARD BITS!

No need now for special cutters for many types of milling if you use the New-Field Universal Fly Cutter. One New-Field cutter using any type of high speed steel or carbide bits makes multiple cuts in one operation. Standard bits are easily reground or replaced when needed for other work. Down time is cut to minimum.



These are only a few of the many different types of cuts possible with a New-Field Universal Fly Cutter.

New-Field Cutters fit all standard arbors on horizontal or vertical mills or drill presses, turn to any required speed, have adjustable bits to permit slots of any shape from 3/16" to 2" for fly cutting, slotting, surface and straddle milling, gear cutting, disc and gasket cutting. Available in 4", 6", 8" and 10" sizes, also 6" and 8" heavy duty size designed especially for Shell End Mill Arbors. Write today for details on this versatile, money-saving tool!

NEW-FIELD MACHINED PARTS CO.

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Export office: States Trading Co., 401 Broadway, N. Y. 15
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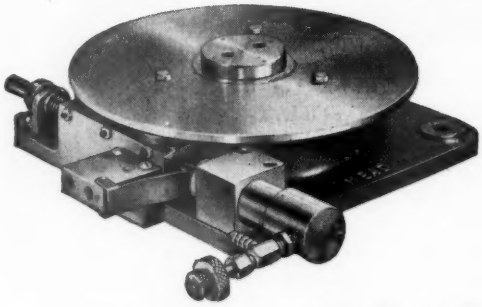
Presenting the Air Operated ROTARY WORKFEEDER!



Typical Work Pieces Handled
by Mead work feeders

Deftly holds and delivers small parts to drill, tap, swage, stake, etc. Stations accurate to .002". Guaranteed against over-travel or "skipping". Indexes as slow or fast as you like, up to 10,000 per hour. Compact and sturdy, easy to tool and hook up.

Standard dial plate 10"; available in 12" For a new job, simply tool up a new dial. Readily combines with "MEAD-MATIC" Timer, Air Hammer, Air Press, Drill presses, etc.—to make almost completely automatic machine—operator merely loads. Write for full details.

Write for Free Catalog!

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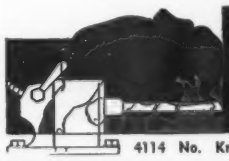


MEAD
SPECIALTIES COMPANY

4114 No. Knox Ave., Dept. HA-93, Chicago 41, Ill.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

. . . Cable-Link, from page 81

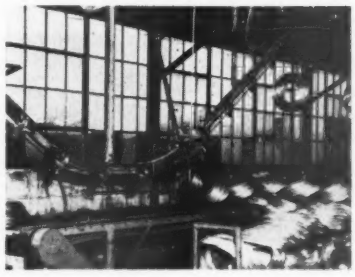


Fig. 3. A Cable-Link installation in a wire rope manufacturing plant is shown carrying and unloading 400-lb. coils of rope automatically.

sure on the cable and completing the assembly.

Trolleys can be placed on 8", 16", 24", and 32" centers. Thus the trolley system is very flexible so far as the spacing of the material to be handled is concerned.

Since this system has no moving parts below the rail and very few bearing points otherwise, the service life of the conveyor system is inestimable.

The company produces three conveyor models capable of light, medium, and heavy-duty handling.

The model C-L#120 operates on a 2" tee rail or split 6" Junior I beam. Models C-L#130 and C-L#140 operate on standard 3" and 4" I beams, respectively. The maximum suspended load capacities of these systems range from 80 lbs. to 500 lbs. per station. Pull loads per drive range from 1,500 lbs. to 4,000 lbs. All of these systems have an overload safety factor equal

. . . *Continued on page 89*

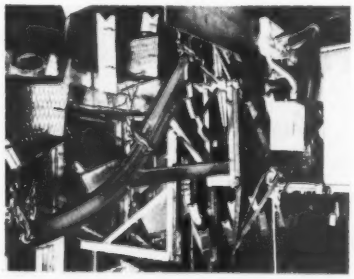


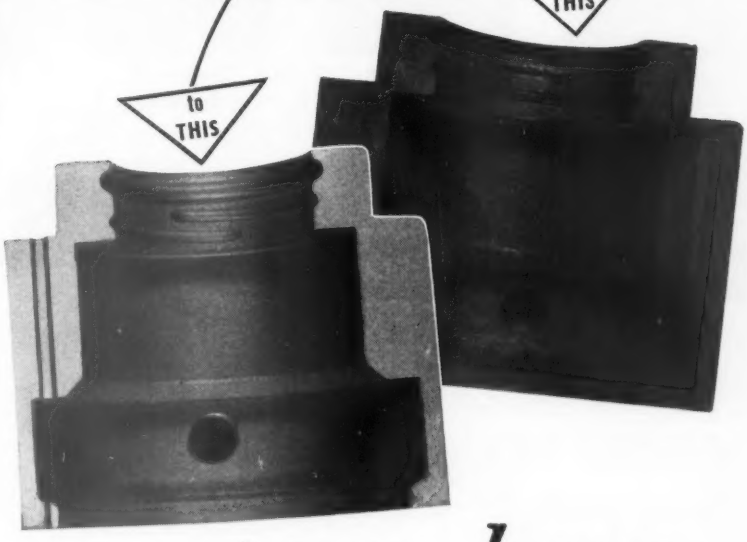
Fig. 4. Barbecue grills are shown being dipped in a degreasing solution by this C-L system, prior to their being carried to the spray booth for finishing at May and Scofield's plant in Howell, Michigan. This illustrates the ingenious use of a C-L system in performing a radical dip to save valuable floor space in a congested area.

finish TOOLS, DIES and MOLDS

in minutes

from THIS

to THIS



. . . and *save hours*

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It takes only 30 seconds to 10 minutes to finish tools, dies, molds, engine parts, etc. with a Liquamatte — an operation that formerly required 1 to 6 hours by hand methods. Scale, fine burrs and grinding lines are removed in a fraction of the time previously possible. For example, savings as high as 80% have resulted on some parts at the Oling Tool Company.

Liquamatte Wet Blasting has eliminated many manual surfacing operations, transforming precision finishing into a mass production operation. It has eliminated all manual polishing except on surfaces where a mirror finish is desired. And the mirror finish is achieved in far less time on a Liquamatte finished surface.

See how Liquamatte Wet Blasting can save time and money for you. *Send today for the bulletins of your choice below.*

THESE BULLETINS TELL HOW

Save Time on Tools, Dies, Molds. | Save Time on Glass Molds | Save Time on Plastic Molds.

American WHEELABRATOR & EQUIPMENT CORP.

LIQUAMATTE WET BLASTING

852 S. Byrkit St., Mishawaka, Indiana

MEN YOU SHOULD KNOW . . . . . .

Bernard Anscher

W. E. Benninghoff

Gordon E. Medlock

Nick S. Deanovich

Hardage L. Andrews

Bernard Anscher has been appointed sales manager for domestic sales of Hydropress Inc., of New York and its Loewy Rolling Mill Division.

◆

W. E. Benninghoff has been elected vice president of the Ohio Crankshaft Co. in Cleveland. Mr. Benninghoff formerly was a power sales engineer for the Cleveland Electric Illuminating Co. He will continue as general manager of Ohio Crankshaft's TOCCO Division.

◆

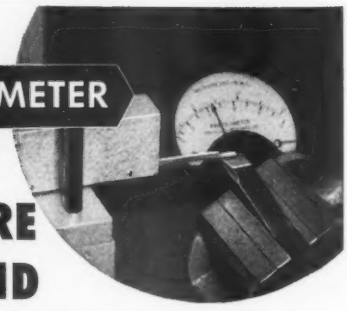
Gordon E. Medlock, formerly assistant sales manager, has been appointed sales manager of Stearns Magnetic Inc., Milwaukee, Wis. Associated with the company since 1946, Mr. Medlock will be responsible for the sales of the firm's magnetic separation and power transmission equipment.

◆

Nick S. Deanovich is the new Texas representative of the Gisholt Machine Co. of Madison, Wis. A graduate of the University of Wisconsin, Mr. Deanovich has been with Gisholt for 15 years. He served the company as a machine operator, foreman and supervisor before entering sales and service.

◆

Hardage L. Andrews, former executive vice president of the General Electric Co., has been appointed to succeed K. Hazen Woolson as president of the Jones & Lamson Machine Co. Mr. Woolson resigned the position after being with the company for 33 years. Mr .Andrews was once in charge of all railroad electifrication and transportation for General Electric. He, also, was a pioneer of the diesel-electric locomotive now used extensively on all railroads.



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you can get

90% to 800% MORE PIECES PER GRIND

from cutting tools of all types!

WELL-KNOWN COMPANIES report *tool life increased 90% to 800% and more*—simply by smooth-finishing the tool faces after sharpening. This same smooth-finishing also enables the tools to produce a *more consistent finish* on the work.

These benefits usually require grinding or lapping the tool faces to a finish of 1 to 5 microinches. A difference of a few microinches makes a big difference in performance. Therefore, to make SURE, many companies *specify* microinch roughness of tool surfaces, and *measure* it with the Profilometer. The savings obtained far outweigh the little time required to make such measurements.

FREE BULLETIN L22 tells

- How consistent surface finish saves time, tools, material.
- Why cutting tools often produce a non-consistent finish.
- How to obtain more consistent finish and more pieces per grind.
- Typical benefits obtained by well-known companies.
- Why most plants use the *Profilometer* for measuring microinch roughness.

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MANUFACTURING COMPANY
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. . . . . MEN YOU SHOULD KNOW

James E. Gray

M. J. Hoke

R. J. Maxey

Edwin W. Shipman

James R. Russell

Firth Sterling Inc., Pittsburgh, Pa., has appointed James E. Gray assistant manager of carbide sales. Mr. Gray joined Firth Sterling in 1929 and has served as office manager of the Carbide Division and was supervisor of Carbide Sales in the Chicago District until his recent appointment.

◆

Recently appointed general manager of Ohio Crankshaft's Camshaft and Crankshaft Division was M. J. Hoke, formerly chief tool engineer for the Consolidated Vultee Aircraft Corporation's Miami Division. A graduate of the University of Cincinnati, Mr. Hoke joined Ohio Crankshaft in 1945 and has served as chief engineer and works manager of the firm.

◆

The Henney Motor Co. of Freeport, Ill., announces the appointment of R. J. Maxey to the post of special assignment on the staff of the vice president. Mr. Maxey's vehicle body building experience includes assembly, metal finishing and inspection as well as supervision of aircraft fuselage assembly. Before joining Henney Motor, he was associated with the Chrysler Corp. for 17 years.

◆

Edwin W. Shipman, who has been associated with the Illinois Tool Works for more than 25 years has been elected vice president and manager of the company's Licensee Division. In another appointment, James R. Russell, a member of the Tool Works since 1939, was chosen secretary of the firm. Mr. Shipman will continue to direct the company's relations with manufacturers licensed to produce Illinois Tool products while Mr. Russell will hold his previous position as assistant treasurer.

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Famco now offers the BEST ENGINEERED, most ruggedly built Band Saws in the market. Provide unobstructed view of cutting operations, and easy access to materials. Four wet or dry cutting models have capacity of 6" round, 6"x12" rectangular stock. Four cutting speeds, quick blade changing, 23 features. See your Famco Dealer or write for free Catalog.

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Conference on Electrification of Machine Tools

The Sixth Annual Conference on Machine Tools sponsored by the Sub-Committee on Machine Tools of the American Institute of Electrical Engineers will be held at the Cleveland Hotel, Cleveland, Ohio, October 14, 15 and 16, 1953. An attendance of 500 is expected, composed largely of electrical and mechanical engineers of the Machine Tool Builders, Electrical Manufacturers and large users of machine tools, such as the automotive and aircraft industries.

A series of eleven technical papers will be presented on a wide variety of subjects from "The Application of Calculating Machines to the Control of Machine Tools" to "Today's Machine Tools Need Modern Electrical Codes".

The technical program provides the engineers with up-to-date information on new products, processes and techniques. They will also have an opportunity to discuss their applications, and mutual problems in connection with various Standards, Codes and safety regulations applicable to the designing, building and use of electrified machines.

This Conference is an activity of the Sub-Committtee to promote its purpose of "Achieving greater productivity and safety of machine tools through electrification, for the purpose of raising the standard of living and aiding the common defense."

Plant tours are also scheduled this year to Ford Motor Company, Engine Plant; Warner & Swasey Company; Reliance Electric & Engineering Company; Chevrolet Motor Company, Transmission Plant.

The Banquet on October 14, will be addressed by Mr. Frederick S. Blackall, Jr., President of Taft-Pierce Manufacturing Company and President of the American Society of Mechanical Engineers. His subject will be "The Engineer's Obligation to a Free Society".

Mr. L. B. Seltzer, Editor of the Cleveland Press, will be the guest speaker at the informal luncheon on October 15.

The last fifteen years has seen a revolution in the electrification in Machine Tools. The circuit design has become so complex that the electrical controls and motors can no longer be considered as an addition to the machine, but must be designed as an integral part of the machine. It is in this field that the Annual AIEE Conference fills a great need.

The AIEE Sub-Committee on Machine Tools is composed of electrical engineers representing the major machine tool builders, electrical manufacturers and users of the country. R. H. Clark, Administrative Engineer, Warner & Swasey Company, Cleveland, Ohio, is General Chairman, Kurt Tech, Chief Engineer of the Cross Company, Detroit, Michigan, is Vice Chairman and V. R. Murphy, Application Engineer, Reliance Electric & Engineering Company, Cleveland, Ohio, is Program Chairman.

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"Saving" by making your own punches is old-fashioned and expensive.
Here's why:
1. PORTER PUNCHES are available for immediate delivery.
..... they save time — money — by keeping your expensive help at profitable jobs.
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..... punches made in your shop are probably made from "available" material ... often the wrong metal for the job.
3. PORTER PUNCHES are offered in standard—and decimal sizes.
..... so your experienced help doesn't spend costly time "whittling."
4. PORTER PUNCHES are reasonably priced.
..... only a "specialist" can make punches as well—or as inexpensively.
Check your labor costs — your "down-time"— and order
PORTER PUNCHES
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the punch you need... when you need it!
Remember — you don't save by making your own punches — you lose.
Still the best performer
PORTER PRECISION PRODUCTS
Princeton 6338 P.O. Box 208
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Porter Punches are in stock in all principal cities.

. . . Cable-Link, from page 85

to 3 times the maximum pull load per drive.

Adaptations of the C-L principle to floor, bucket-elevator, and apron conveyor models are now being completed with some of these models now in the process of installation.

Clamped Carbide Insert Tools Boost Production of Mounted Railroad Wheels

Turning of wheel sets has always been a serious problem for railroad maintenance shops—production time ran too high. Now by the use of tungsten carbide tooling, diesel and car wheel sets are machined in approximately 18 minutes floor to floor time at the Citico Wheel Shop of the Southern Railway System, Chattanooga, Tenn.

Operations are handled with

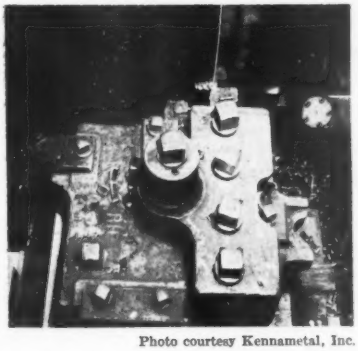

Photo courtesy Kennametal, Inc.

Diesel and car wheel sets are machined in approximately 18 minutes floor to floor time using three carbide insert tools in each turret of double end lathe equipped with hydraulic feed and profiling attachment. Tools remove rollover, cut down high portion, profile, and machine inner side of flange.

Kennametal clamped tools on a Niles 52-inch car wheel lathe equipped with hydraulic feed and profiling attachment. This rugged 100-horsepower lathe has double end chucking, drive, and tooling.

Three clamped insert tools are used in each turret as shown in the photograph of the right-hand turret: Tool #1 removes excess-

. . . Continued on page 96

How to get...

Production Plus

Darwin PRK • 33 TOOL STEEL

Proven production increases of 50% to 1330%* are the "plus" from proper applications of Darwin PRK-33 Tool Steel. Its unique composition of added 3.3% Cobalt, 13.00% Chromium, Nickel, Manganese, Silicon and Molybdenum give PRK-33 stainless and non-corrosive qualities—**plus, rigorous durability.** If you are now using standard 150 carbon, air-hardening, high carbon, high chrome tool steel and need even greater production runs, write or call today for further information on "production plus" from PRK-33.

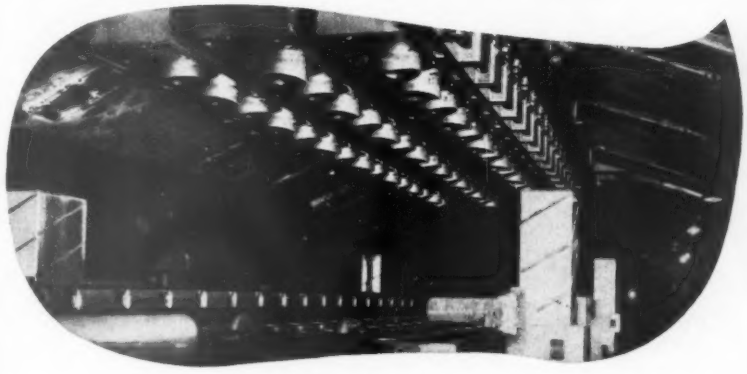

Illustration shows production of aircraft landing mats with PRK-33 stamping dies. Records show approximately 4 carloads stamped per day, period of over 90 continuous days—without need of regrinding or redressing.

* PRK-33 USERS REPORT

Drawing Dies — Philadelphia concern did over 60,000 pieces per grind, against previous best record of 16,000.

Hot Coining Dies — Increased production from previous high of 7,000 pieces to 100,000 (1330% increase) without sign of heat or wear cracks.

Knurling Tools — Beats not only High Carbon — High Chrome but also High Speed Steels in many cases. One case reports 50% better than High Speed Steels.

Complete line of highest grade Tool Steels, including NEOR, MINEOR, OHT, "MT6" and various grades of Hot Work Steel. Furnished in bar stock, billet, sand casting. Drill rod, flat ground stock, tool bits.
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. . . Month's Talk, from page 75

papermaking is a 24-hour job in any case and all shifts are normally fully manned. The increase, from an output standpoint, was quite a remarkable task accomplished the hard way, by speeding up the machines. I have my doubts, however, if efficiency was very great or that costs were anywhere near as low as they should have been.

It was common practice, prewar, for paper machines to be run slower than rated speed. The theory was that the machine thereby lasted longer. Maybe so, but it is now clear that for processes such as we are discussing here there are technical optimum values for all pieces of equipment. These dictate the rate of speed or temperature or flow that produces greatest efficiency and lowest cost. It is quite possible that, even pre-war, when the machines were run slowly, the savings in longer machine life were offset, possibly many times over, because of inefficiencies created in other parts of the process. Under pressure, the machine was speeded up, thereby turning out more paper but requiring more heat in the rolls, a bigger header-box, more activity one way or another to produce more pulp through the beaters and digesters. Again we see a piecemeal, haphazard action, some parts of which probably brought business to the instrument industry. Still, it bothers our sense of co-ordinated efficient manufacturing. Instruments should be used to promote efficiency and low cost through accurate and sensitive measurement and control rather than to aid forced draft output, regardless of cost.

System engineering—this advance planning of which I spoke—will prevent the erection of lopsided factories in which some elements work at percentages of capacity far below their maximum. It will promote balanced equipment. It will save money by cutting down disproportionate investment of this kind and it will reduce the cost by greater efficiency. It may even build in deliberately a reserve of capacity for emergencies, not waiting to let it be found by costly trial and error, or to be gained by artificial methods, requiring a cost penalty.

The theoretical made practical

Increasing efficiency is one field of opportunity for industrial instrumentation and system engineering in general. Another—where automatic control actually makes the operation possible, rather than simply facilitating operations which could be carried on less efficiently without controls—accounts for the great concentration of control instrumentation in the chemical and petroleum industries.

A widely used modern type of oil refinery operation is that of the fluid catalytic cracking plant. In such a plant petroleum is heated in the presence of a finely powdered catalyst, to break the crude oil into gasoline and heavier components. The oil vapors go to a fractionating column where the lighter components are taken off for final processing and the heavier oil is run back through the catalytic reactor for repeat treatment.

A refinery's controls all concentrate on one objective—maintaining the conditions

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Boring Tools
by LEHMANN can:
• Put Accuracy, Utility and Economy into your Boring Operations
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That's right! The engineering staff and skilled machinists at LEHMANN can help you put efficiency and accuracy to work in your boring operations. Boring tools especially designed and engineered for your needs, help cut machining time to a minimum, give you accuracy, save you money! LEHMANN Boring Tools have been approved by industry for 35 years. Put LEHMANN'S experience to work for you.
Shown at right is a partial set of 36 boring bars especially designed for a large lathe manufacturer, by LEHMANN BORING TOOL for a re-tooling program on a new lathe headstock.
Tell us your boring problems without obligation or write today for CATALOG BT-12 to:
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which give maximum product yield and quality. To do this, all possible variations everywhere else in the plant must be met and offset. A difference in the grade of the oil going into the process, corrosion or building up of deposits in a pipe or valve, differences in outside temperature which would alter the calculated rate of heat loss from inside equipment—all these introduce variations which must be corrected. Each change reports itself to the appropriate control mechanism, and the control mechanism compensates for it. All the records of the mechanisms are brought together in one place on a panelboard for the guidance of the few human operators who may oversee the functioning of such a refinery. This control panel, with each unit of the refinery represented, may report on several hundred individual valves, indicators, recorders and controllers of specific operations.

The workers on such a refinery unit number about six or seven. One can readily see that these people cannot physically make the adjustments required in the operation of these several hundred valves and other pieces of equipment. The tireless instruments can and do—many times faster and more accurately than the human operators could.

Here again is seen the matter of setting the limits and then using automatic control to accomplish the result. In this highly automatic refinery, the human operators need only to watch for changes of condition that may require a change of limits or to be on hand in the event of breakdown or equipment failure.

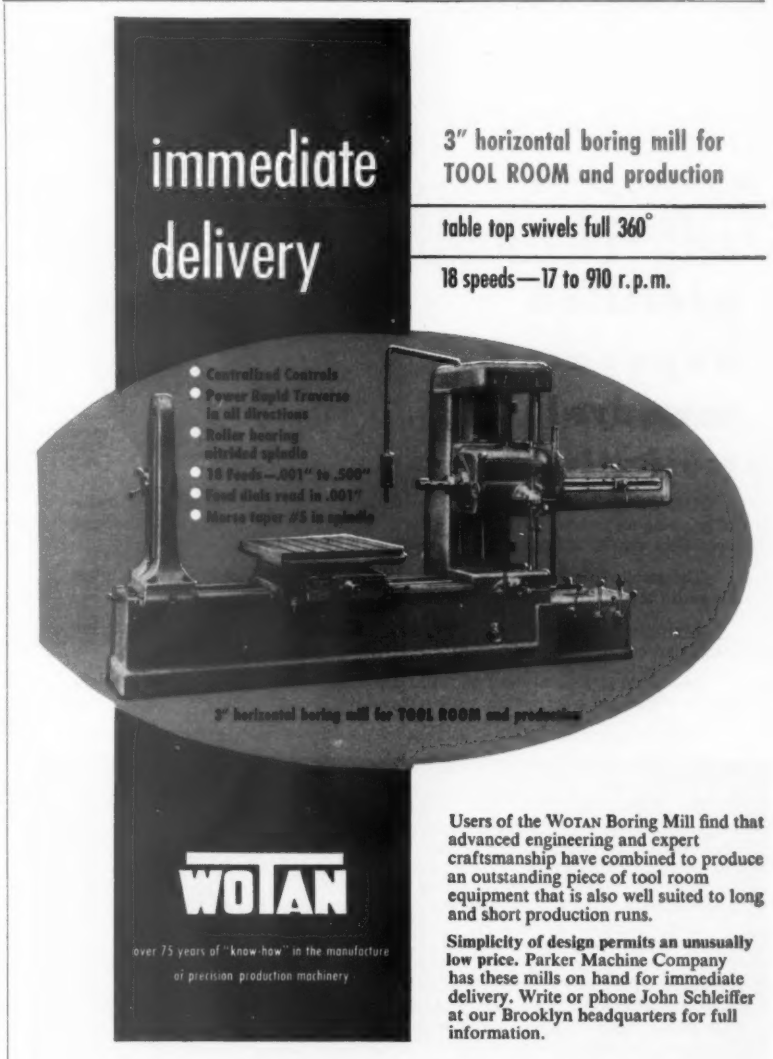
It has been estimated that if pre-instrument control refining were substituted for present-day methods, runs of crude oil through refineries would have to be multiplied four times and plant investment five times to produce the quantity of gasoline we use each year—and the gasoline would be of vastly inferior quality.

Our goal—and yours

What we are trying to do—just like every other branch of industry—is to produce a perfect product safely at minimum cost. That's a large order, and the minimum cost is not the least significant part of it. Unless the economics are right, the technology is of little use.

While we have a host of automatic devices for regulating the more obvious variables of the manufacturing processes—temperature, pressure, flow—I believe that we will more and more control from the characteristics of the product. We call this product quality determination. With all the variations in quality between different products, the need of further work between the manufacturers of instruments and users is implied. Undoubtedly, there will also be a widespread need for new means of sensing and controlling qualities.

It has been calculated that the areas of industry in which no one would think of moving without feedback control constitutes about an eighth of all industry. We have, in part, conquered combustion, power generation and control, communications, and most fluid processing. Ahead of us lie the rest of manufacturing, and some day, perhaps, certain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3" horizontal boring mill for
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table top swivels full 360°
18 speeds—17 to 910 r.p.m.
Controlled Controls
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in all directions
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nitrided spindle
18 Feeds—.001" to .500"
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over 75 years of "know-how" in the manufacture
of precision production machinery
Users of the WOTAN Boring Mill find that advanced engineering and expert craftsmanship have combined to produce an outstanding piece of tool room equipment that is also well suited to long and short production runs.
Simplicity of design permits an unusually low price. Parker Machine Company has these mills on hand for immediate delivery. Write or phone John Schleiffer at our Brooklyn headquarters for full information.
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TOOL & CUTTER GRINDERS
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HORIZ. & VERT MILLERS
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steps in merchandising, accounting and banking operations.

When we tackle all those, we shall certainly need an improved technology. Perhaps I can illustrate some of the work we must do. For one thing, as controls multiply, we must make each device smaller. They will take up too much room if we don't. I have mentioned the control boards which help workers operate the catalytic cracking refinery. They presently seem to serve a real purpose. But will they, say, 20 years from now? By then we may have perfected automatic control so completely that we will not need to march up and down in front of the panelboard and watch gauges or recorders. Scanning, computing, digital recording and television can be linked when it is profitable to do so to make the present panelboard a dead or dying dodo.

self releasing precision expanding mandrels

.0005" ACCURACY GUARANTEED

ERICKSON PRECISION EXPANDING MANDRELS provide the ideal means of gripping on interior surfaces. With them, close tolerance machining or checking operations can be accomplished with exceptional speed.

The mandrel sleeve, alternately slotted from each end, expands and grips along its entire length . . . accommodates variations over 1/32" range.

A single mandrel shank is usable with an entire series of sleeves and can handle an enormous variety of work.

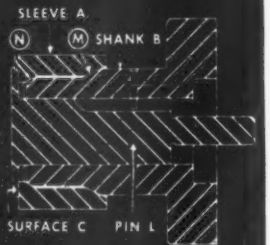
Besides the illustrated standard models, multiple sleeve and other special designs can be adapted to meet specific job requirements.

Sleeves can be machined to fit splines, undercuts, threads, and other internal contours.

A-7510

the inside story...

Sleeve "A" is automatically lined up concentrically with the axis of shank "B" by the sleeve's cam surfaces "M" and "N". These mate with the cam surfaces of the shank to within .0001". Sleeve "A" is open slotted at both ends. When pin "L" is drawn back against surface "C" sleeve "A" expands equally over its entire length. Release of this force instantly relieves the mandrel's grip. Some models use locknuts to expand the sleeve instead of the drawpin in the diagramed design.



ERICKSON PRECISION HOLDING TOOLS INCLUDE Collet Chucks, Floating Holders, Air Chucks, Tap Chucks, and Speed Indexers.

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ERICKSON TOOL COMPANY

How to get a "head start" on your competition

You will notice that I have not halted to document all the things I have said about special instruments and processes. But it is important to emphasize the implications of new technologies. We must open our eyes to the fact that the companies which make this step first will have a long head start on their competitors in a probably more ruggedly competitive economy.

Until now, the user of a control device has usually been the master mechanic or the factory manager. The equipment manufacturer offers one machine without controls and another with controls. The contractor and factory manager decide which shall be bought.

One might think that the instrument maker hasn't fared so badly under that scheme. As I myself pointed out before, investment in instruments rose twice as fast in the last 15 years as did the total investment in all plants and equipment. But despite this expansion and apparent success of our industry, we cannot overlook the obvious fact that as our technology progresses, the decisions to be made—when the aim is the economically fullest possible automation—lie not with the contractor or factory manager, but with the upper echelon of financial and management people. It is apparent that such decisions are of a different order than those involved simply in buying a machine which will enable two men to do five men's work.

Automation frees inventory dollars

Actual instrumentation costs vary widely from industry to industry. Spread over all industry, they would be no more than six per cent of total process equipment costs. Balanced against this—and here again is obviously a decision for the highest executives—is the increase in output. Automation reduces the amount of goods in process in a plant. It makes it possible to schedule more accurately the inventories necessary to keep the plant running. Actually, it is quite possible, comparing many factories today with the factories

turning out equivalent work with proved control methods, to say that instrumentation would "cost nothing at all." The cost of controls would be offset by contraction of inventories and stocks of goods in process. And while we are commenting on possibilities, let's not overlook that cost accounting may some day be done automatically with the actual manufacture.

Will robots replace manpower?

Whenever one talks of automation, or even of a partial step toward that goal, he must pay some respect to the science-fiction forecasts of workless Utopias and robot plants. The pessimists gloomily assert that this will complicate our existence, enslave man to the machine, and wipe out creativeness. The optimists radiantly proclaim the coming golden age of prosperity, leisure and culture.

Our vice-president of engineering, George M. Muschamp, discussed these problems recently in an appearance before the American Society of Mechanical Engineers. George said:

"Rolling mills today are capable of turning out strip steel at around 5,000 feet a minute. How many blacksmiths do you suppose would be required to beat out a strip of steel at 5,000 feet a minute? Would you say 50,000 blacksmiths conservatively? A rolling mill today employs possibly 10 people. Against beating out so much steel with the aid of hammers, the gain is fantastic—a mechanical advantage of 5,000.

"Can you imagine the number of people who would be required to produce by hand all the ingredients of all the things everyone wants. Isn't it clear that we simply haven't the people to produce these goods except with vast mechanical aids. We had the choice of doing without these things or using machines to produce them. When we decide we want more of a certain class of things, the question of investment in the machines to make them available is introduced. This is the nature of the automatic factory. We have seen no evidence that the demand for more things is any less than it has always been."

I agree, and I think you will, that this is the true picture. The multiplication of man's effort through mechanical aid is what is essential, not the replacement of a man or several men by the machine. To quote George again, "You don't buy your wife a washing machine because you are trying to get rid of her, but because you want more of her company when she isn't bushed from bending over a washboard."

Workers themselves long ago had the choice of doing without the products we now take for granted in our twentieth-century mode of living. They decided they did want these things, and the machines to make them available were introduced.

Those of you who have foreboding about this trend toward automation, thinking perhaps that it will obsolete the human being, must remember that the worker himself, even when we call him unskilled, is a magnificently sensitive and adaptable machine. He performs sensing, safety and other operations which it is often difficult and expensive to do automatically. For example, when the Atomic En-

. . . *Continued on page 95*

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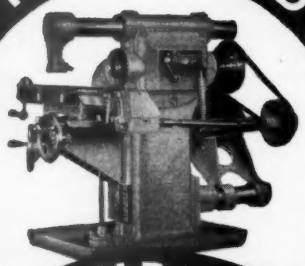

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THE **U. S. - BURKE** MACHINE TOOL DIV.

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. . . Month's Talk, from page 93

ergy Commission set out to devise a machine to uncork a bottle, pour out some of the contents, recork the bottle and replace it on its shelf, it faced an expenditure of many hundreds of thousands of dollars and hours of design time. While this example is a simple one, it serves to illustrate the point.

Top management must become "automatic-minded" now!

As I have previously brought out, much automation is now as close as the nearest engineer and master mechanic. The technology is all around us, ready to use. But first the system engineering responsibility must be set. Education must be broadened. Somehow we must pour enough knowledge of controls into our mechanical engineering, civil engineering, chemical engineering, electrical engineering and business administration courses so that each specialty will overflow and all will merge at the level of system engineering and administration. The over-all concept is ready to do great things for us. It waits only on a new awareness at the top management level—the board of directors. Local management, working from below, in traditional ratios of expenditures, can't possibly impose system engineering as a separate function deserving its separate budget. Let us remember that in the final analysis, system engineering is just the latest in the long train of human efforts, which began with the invention of the wheel, to substitute animal or elemental power for human muscle. It is perhaps true that because of the amazing acceleration of technical progress, we are the first generation of those who can see what tomorrow can be like.

Cemented Carbide Movie Gives Historical Account of Cutting Tool Material

The whole dramatic story of Cemented Carbide is related in a film recently produced by the Wesson Metal Corp. with the aid of several large industrial organizations.

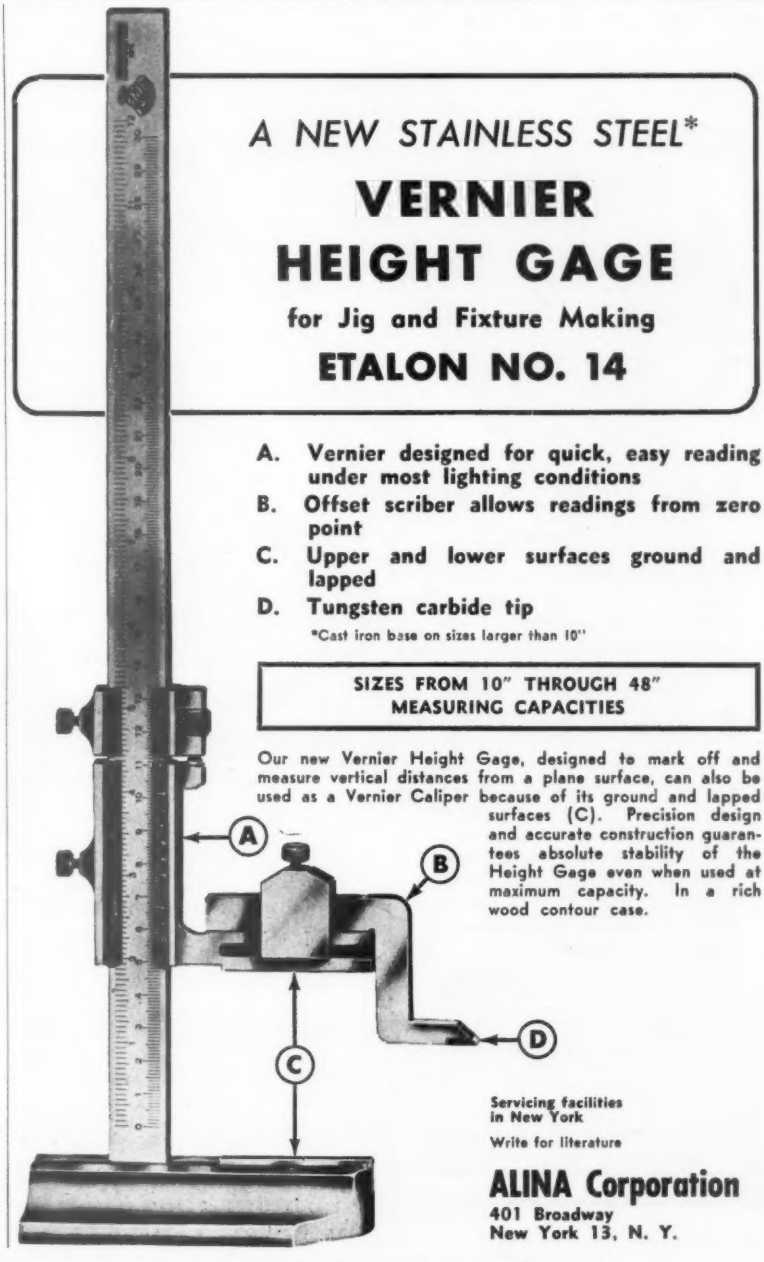
Titled, "This Carbide Age," the film can be borrowed by writing to the Wesson Company, 1220 Woodward Heights Blvd., Detroit 20, Mich., and informing the firm when you would like to have it.

The film starts off with a brief historical account of the beginning of the hand tool age and carries the viewer through the development of cemented carbides up to the present modern use of the tools.

Scenes showing some of the most outstanding metalworking methods for which American industry is so famous add to the interest of this film.

"This Carbide Age" was produced under the technical direction of men who have worked with cemented carbides from the days powder metallurgy was developed by the Krupps of Germany for producing the cutting tool material.

Assisting Wesson in making the highly informative movie were scientists, metallurgists and engineers from the Chrysler Corp., Ford Motor Co., Caterpillar Tractor Co., Buick Motor Car Co., Westinghouse and International Harvester Co.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. . . Carbide Insert, from page 89

ive mushroom or rollover on outside of flange. Tool #2 removes high portion of flange while insert A of tool #3 is profiling the tread. This insert profiles from the outside radius across the tread and up to top of the flange. Inner side of flange is next machined with insert B to complete the wheel.

Cutting edge of tool #1 has 0.030-inch wide x 5-degree negative land. Tools #2 and #3 have parallel chip breakers ¼-inch wide x 0.020 - 0.025-inch deep. Before tools are put into service the operator hones the cutting edges to approximately a 0.005-inch radius.

Hydraulic Controls Assure Constant Feed — Operation of each turret is independently controlled. The operator staggers the cutting period of each turret to minimize peak power load. Amount of power consumed is indicated on an ammeter in full view of the operator. Longitudinal and cross movements are controlled hydraulically to maintain constant feed along the machined surface.

Amount of stock removal is determined by a flange gage and by tape size of the wheel as specified by the American Association of Railroads. Left and right tracer styluses are then set with a measuring rod graduated in tape size to assure uniform wheel size.

Freight and passenger car wheel sets of 33 and 36-inch diameters, are machined at 0.082 to 0.086-inch feed, 12 revolutions per minute and 1/16 to ⅞-inch depth of cut (average ¼-inch). Profiling time is about 8 minutes for freight and passenger car wheels.

Left and right-hand set of three tools each are Kennametal Grade K2S clamped inserts as shown in photograph.

Facilitate Stretch-Forming Operations

A flexible jaw especially designed for use on all types of sheet stretch-forming equipment is known as the Hufford Hydra-Curve Jaw. Its function is to grip and curve the sheet to the cross sectional contour of the die. While held in this profile, stretch-forming then completes the longitudinal curves of the part.

Sheet forming operations have long been subject to unavoidable material waste, occurring between ends of the forming die and straight jaws gripping the sheet. Up to now, this waste was necessary. Its purpose was to permit strains to equalize between the formed part and the straight jaw, thus preventing tearing. Hydra-Curve Jaws were developed to greatly reduce this waste, thus cutting material requirements and cost. The illustration above compares the gripping action of the straight jaws as against that of the Hydra-Curve Jaw.

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PRECISE hole location, easy contour inspection with *new* machine tool microscope

Any machine shop, large or small, can save time and money on milling and boring work with the new Perkin-Elmer Model 11 Machine Tool Microscope. For hole location, its wide field of view (¼") or 30x magnification makes it possible to gage accurately to a ten thousandth—*at a glance.*

Mount the Model 11 on an offset bracket or directly in the spindle—it will fit nearly any machine tool. When offset it can be used for transferring hole locations from template to workpiece. The image always appears erect and moves in the same direction as the work, making it ideal for checking contours, slots, surface conditions. The Model 11 Microscope is compact, sturdy, rugged—designed for long life, accurate service.

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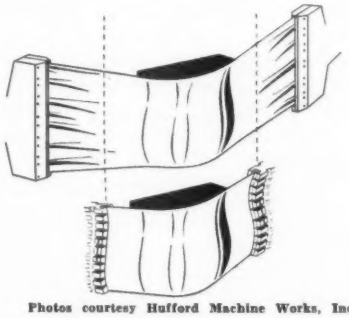
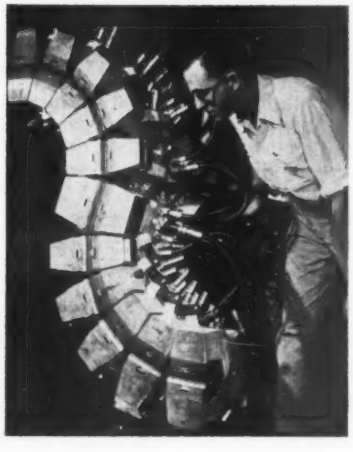
Use of Hydra-Curve Jaws saves as much as 30% of material normally allowed beyond ends of the die for transitional stresses in the sheet. It simplifies formation of all parts with less wrinkling and permits formation of exceedingly deep curves



Photos courtesy Hufford Machine Works, Inc.

by the stretch-forming process. Since stresses are considerably lower in the sheet using Hydra-Curve Jaws, many aluminum parts can be formed in the ST condition, thus saving furnace hours.

These Jaws are composed of numerous segments, each containing a set of hyraulically actuated grippers. The segments are hinged, one to another by pivot pins, thus permitting con-



formation to a wide variety of die curves . . . half round, "S" shapes, convex or concave forms, etc.

Degree of curvature is established by adjustable set-screws, which act as fixed stops in front of and behind each segment. Jaw curvature is energized or straightened by a pair of hydraulic cylinders in each segment which are controlled from the operator's pedestal. Jaws are always loaded in a straight line position; curved just before or during the stretch-forming operation.

To centralize the load of a curved shape to the tension cylinder shaft, a centroid shifter is provided. This is essentially a slide on which the jaw is mounted permitting its position to be shifted laterally by a hydraulic cylinder or screw.

Jaw elements consist of two removable gripers in each segment, serrated for holding the work, and sliding on opposed tapers. Although opened or closed by a hydraulic cylinder, gripping action is self-energized by the taper itself.

Hydra-Curve Jaws are designed in sizes for use on all Hufford stretch-wrap forming machines, and can be made for use on machines of other types.

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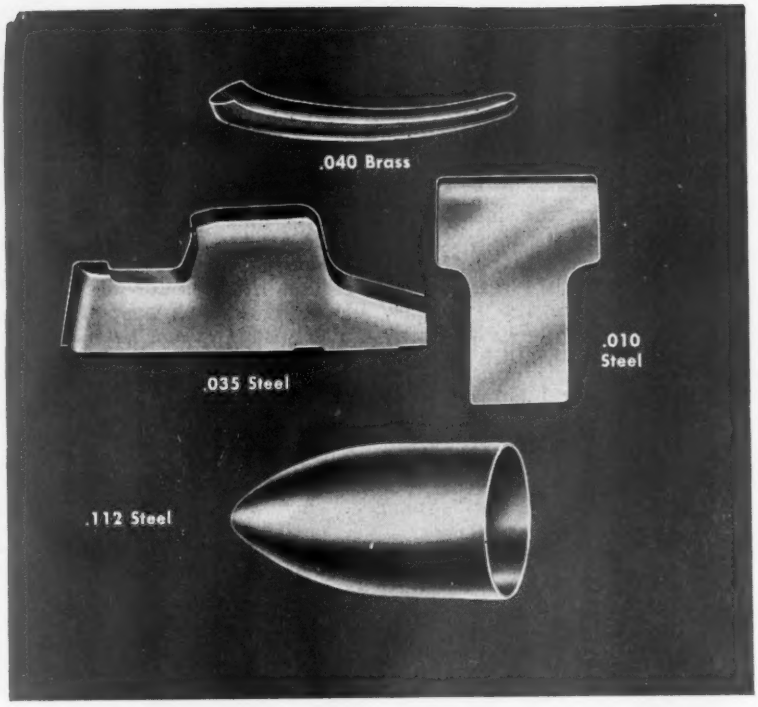

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A Brehm "Shimmy" Trimming Die with angular cams, cuts four ways in one press stroke, handling straight or curved edge contours, with multiple notches and projections. Slow, costly "horn" and "pinch" trimming operations are eliminated.

Write today . . . for your free copy of the Brehm Die Catalog. If you wish, submit blueprints or parts for full information or quotation.

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THE STEEL PRODUCTS ENGINEERING CO.
BREHM DIE DIV., DEPT. 18, SPRINGFIELD, OHIO

. . . Thread Inserts, from page 79

The air inlet screens at the front of the engine pivot on shafts which revolve in spherical bearing pillow blocks supplied by The Heim Company, of Fairfield, Conn. In Figure 1 is shown one of these pillow blocks along with a wire thread insert. The tapped hole at the top of the bearing has already been protected with a ¼-28 insert, ⅜ in. long.

Sound logic dictated this use of inserts. Engine design limited the size of bearing that could be applied in this area (Figure 2). Unfortunately, this size would not allow sufficient thread engagement for secure retention of the cap screws. However, the higher loading strength made possible by greater flank engagement permitted by the insert solved this problem. The insert - protected holes in the pillow blocks proved able to withstand frequent disassembly as well as resist vibrations and stresses.

A bonus feature in the use of this component is ease of installation. The inserts are formed of stainless steel wire having a diamond shaped cross section. Each insert is precisely coiled to an outside diameter slightly larger than the major diameter of the tapped hole.

As the insert is screwed into the hole, the action of the inserting tool slightly reduces the free diameter of the coil. This reduction in diameter seats the insert under spring compression so that it cannot shift after installation. Flexibility of the coiled wire insert allows more equal distribution of the load over each thread rather than over just a few threads.

. . . Broach, from page 76

passes, a shuttle rack, roller mounted, is connected with the broach ram. When the broaching pass is finished, the rack is immediately above the broach to be removed. The broach is hoisted to the rack by first swinging the crane arm into position. Then padded hooks on the hoist pick up the heavy broach and place it in the rack. The ram returns to loading position with the rack following. The crane swings around to pick up the next broach from the rack and lowers it into broaching position. Broach is attached to puller for next pass.

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. . . Crowning, from page 82

out a crown, the crowning cam is disengaged. The table then remains horizontal throughout its stroke.

The pivoted table also offers the possibility of shaving gear teeth to a predetermined taper. In this case the table is set at the desired angle and locked. Shaving then proceeds on the conventional cycle.

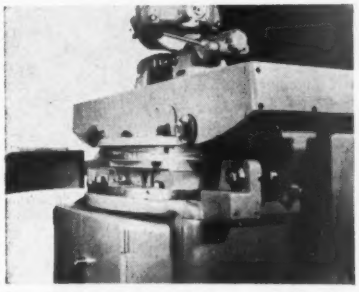

Fig. 2 Crowning cam on a Red Ring Gear Shaving Machine is shown in right foreground.

As optional equipment the recently announced differential upfeed mechanism may be incorporated with this machine. This provides automatic precision up-feed in selected increments throughout the shaving cycle and automatic return to proper backlash position at the end of the cycle. Any number of cutting strokes may be used, each with its own increment of feed and any number of idling strokes, all automatically controlled.

Chrysler Wins Safety Awards

The National Safety Council's Award of Honor, the nation's highest industrial safety citation, has been awarded Chrysler Corporation's Plymouth Plant in Detroit for its outstanding safety record during 1952, it was announced by John P. Mansfield, Vice President of Chrysler Corporation and President of Plymouth Division.

The award was based on Plymouth's frequency rate of only 2.2 lost-time accidents per million man-hours worked, and a severity rate of five one-hundredths (.05) of one day lost due to accidents per thousand man-hours worked.

This compares with national automotive industry figures of

. . . *Continued on page 166*

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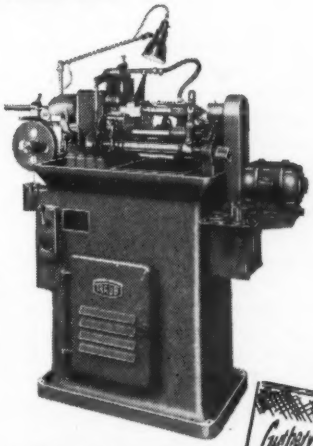

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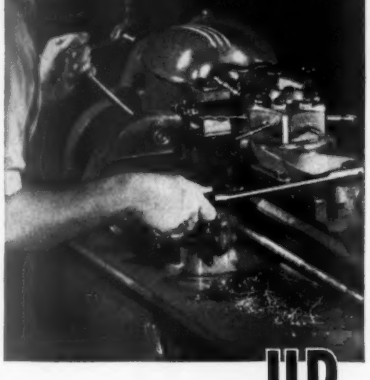

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Here's a precision turret lathe that will help you increase production and reduce costs on precision parts. High output comes easy on the Series 900 South Bend Turret Lathe. It's quick and easy to operate. A wide range of speeds and power carriage feeds contribute to efficient machining. Close tolerances can be held without sacrificing speed. These features make the Series 900 Turret Lathe ideal for second operation work. If you are producing small precision parts, it will pay you to find out more about South Bend Turret Lathes which are made in three sizes: ½" to 1" collet capacity, 9" to 16" swing. Write for catalog on Engine Lathes, Toolroom Lathes, Drill Presses and Shapers.

SPECIFICATIONS

Collet Capacity: ½". Spindle Bore: ¾". Swing: 9¼" over bed, 3⅞" over double tool cross slide, 5½" over compound cross slide. Turret to Spindle Distance: 20⅝". Twelve Spindle Speeds: 41 to 1270 r.p.m. 48 Power Longitudinal Feeds. 48 Power Cross-feeds. 48 Thread Cutting Pitches R.H. or L.H. 4 to 224 per inch.

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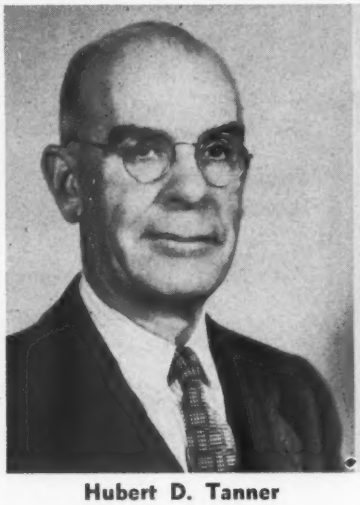

Hubert D. Tanner

Charles M. Pond

Pratt & Whitney Executives Retire After Long Service

Two pioneers in the metalworking field with a combined total of 83 years service with Pratt & Whitney have retired.

Charles M. Pond, widely known both in this country and abroad as an outstanding expert on cutting tools and gages, retired as vice-president and director of Pratt & Whitney, Division of Niles-Bement-Pond Co., after 50 years of service.

Hubert D. Tanner, also a vice-president and director of P & W, steps down after serving the organization for 33 years.

Mr. Pond has served as chairman of the Committee on Standardization of Taps and Reamers for the American Standard Association and was a member of the Cut and Ground Thread Tap Advisory Board during World War II. Under his leadership, there was developed a wide variety of gaging equipment that played an important part in World War II material production.

Mr. Pond began his career with P & W in 1903 after finishing his education at Columbia University's Mechanical Engineering School. Upon completing his apprenticeship, he was transferred to the P & W New York Office. In 1912, Mr. Pond opened the first P & W office in Cleveland, Ohio for the sale of small tools.

Mr. Pond also has served as sales manager of the small tool division in Hartford, manager of that department and manager of the combined small tools and gage departments. In 1939, he was elected vice president and director of P & W.

Mr. Tanner's career in the metalworking industry began at the Brown & Sharpe Co. of Providence, R. I., in 1912. He joined that firm as a design engineer after attending Brown University and the Rhode Island School of Design.

He joined P & W as a machine designer, specializing in the development of gear grinding and thread milling machines in 1920. He also served as manager of the Machinery Department and was elected vice-president and director of P & W in 1939.

During World War II, Mr. Tanner was responsible for the coordination of the company building expansion program with the requirements of Pratt & Whitney's war production effort.

Industry News

Fred W. Gollbach, president of Ace Tool & Die Co. and chairman of the board of the newly-formed Ace-Central States Machine Tool Co., has been elected president of the Detroit Council of the National Tool and Die Manufacturers Association.

YOU GET *SPEED* PLUS ACCURACY WITH MOORE JIG BORERS

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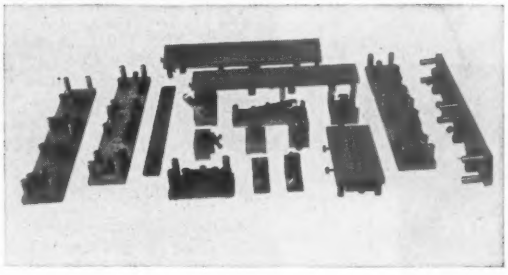
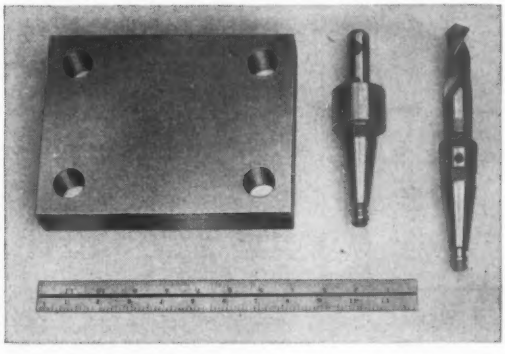
400 holes to "tenths"—5 to 7 minutes each on the No. 1 Moore Jig Borer



Manufacture of this group of drill jigs involves accurately locating, drilling and boring approximately 400 holes. The No. 1 Moore Jig Borer finished them to "tenths" in from five to seven minutes per hole.

ON PRODUCTION

64 holes to ±.0002"—2 minutes each on the No. 2 Moore Jig Borer



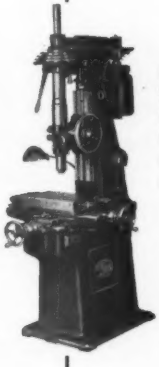
Sixteen pieces like this were located, drilled, bored and checked on a No. 2 Moore Jig Borer with one drill and one carbide bit. The 64 holes were finished in 2 hours and 8 minutes (plus 30 minutes setup) with location and size tolerances ± .0002".

Only a precision machine geared to the high American production standards of ruggedness *and* accuracy can meet these performance requirements. For versatility and speed in spotting, drilling, reaming, boring and checking operations in production as well as tooling, no other moderately-priced machine tool compares with the Moore Jig Borer. And there's no sacrifice of accuracy for speed, since the lead screw measuring system built into each Moore machine permits working to the closest of tolerances.

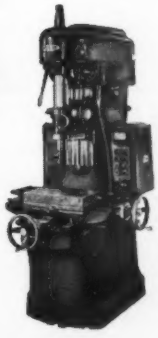
You'll find that the Moore Jig Borer can pay for itself—*in jig time.* Write today for detailed bulletins.

Moore Special Tool Company, Inc.

726 Union Avenue, Bridgeport 7, Conn.



NO. 1 MOORE JIG BORER
Table working surface of 10"x16". Over 1200 now in use throughout the world. The ideal small, accurate jig borer. Lead screws accurate to .0002" in 16".



NO. 2 MOORE JIG BORER
Table working surface of 10"x19". Heavier cuts, larger holes. Features infinitely variable spindle speeds, three power feed ratios, centralized control panel.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

see our catalog in MACHINE TOOL CATALOGS or write for copy

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

Keep Informed • CATALOGS BULLETINS • SPECIFICATIONS

PUBLICATION

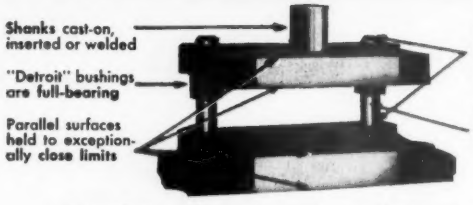
A Comprehensive and Analytical Study of Hard Facing, its application and its wear-resisting qualities, wherever impact and abrasive conditions exist, is contained in a new 52-page brochure published by Mir-O-Col Alloy Co., 312 N. Ave. 21, Los Angeles 31, Calif. A special section of this report recommends specific hard-facing rods for over 1,000 individual pieces of equipment subject to impact and abrasion.
Circle Inform-A-Gram No. B1.

Precision Double Spindle Grinders, made by the Gardner Machine Company, Beloit, Wis., are described in new literature available from the firm. A recent edition of the Gardner Catalog reviews the company's full line of machinery and presents data on several redesigned models. The catalog should be of special interest to readers who are involved in parallel surfacing operations.
Circle Inform-A-Gram No. B2.

YOU PAY FOR THE BEST . . .
BE SURE YOU GET THE BEST

FACTORY-BUILT IS BETTER-BUILT

When you specify "Detroit" die sets, you are assured micro-metric precision that means: 1) Lower costs in mounting die in die set and 2) Longer, trouble-free production runs. Factory-built die sets give you what you pay for—parallelism, squareness and finish.


Shanks cast-on, inserted or welded
"Detroit" bushings are full-bearing
Parallel surfaces held to exceptionally close limits
Leader pin holes and bushing holes are micro-metric jig bored
"Detroit" precision leader pins are superfinished

Factory-built to the most exacting standards, "Detroit" die sets are also factory-assembled and factory-inspected. You don't have to re-work "Detroit" die sets in your shop to get the accuracy and performance you have a right to expect.

For prompt factory delivery, call "Detroit"

DETROIT	TR 2-5150	MINNEAPOLIS	PR 1822
BIRMINGHAM, ALA.	3-1341	MONTREAL, CAN.	WI 1186
BUFFALO	CI 0163	NASHVILLE	6-2597
CHICAGO	PU 5-7694	NEWARK	MA 2-4318
CINCINNATI	HU 7775	PHILADELPHIA	VI 4-4084
CLEVELAND	TO 1-0860	PITTSBURGH	LO 1-4011
DALLAS	TE 3818	ROCK ISLAND, ILL.	RI. 8-2814
DAYTON	HE 3042	ST. LOUIS	FR 6811
INDIANAPOLIS	HU 5604	SEATTLE	SE 7997
LOS ANGELES	AD 7251	TOLEDO	MA 4510
MILWAUKEE	GL 3-7170	TORONTO, CAN.	KE 2972

DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. • DETROIT 2, MICH.

DETROIT DIE SET ★

Meehanite Castings and Ductile Cast Irons are the subjects of two recent publications of the American Brake Shoe Co.. 230 Park Ave., New York 17, N.Y. The booklets describe and give the characteristics of Meehanite. a family of irons produced to meet certain specifications and of Ductalloy, the trade name of ductile cast irons produced by the American Brake Shoe Co.
Circle Inform-A-Gram No. B3.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32. Mich. has available for distribution a new bulletin describing its many new machines designed and built to work on jet engine parts. Described in detail are five Ex-Cell-O machines and the sequence of operations used for machining of jet rotor blades and buckets from rough forgings to highly finished precision products.
Circle Inform-A-Gram No. B4.

Pangborn Corp., Hagerstown, Md., has revised its Blastmaster Rotoblast Bulletin (No. 223-A) to include specification data on the new Blastmaster airless cleaning barrel.
Circle Inform-A-Gram No. B5.

Diamond Tools. This catalog, offered by Maurice S. Dessau Co., 535 Fifth Ave., New York 17, N.Y., is designed as a guide for the selection of the proper diamond tool. Subjects range from diamond dressing tools to boring tools, diamond powder. shaped tools, etc.
Circle Inform-A-Gram No. B6.

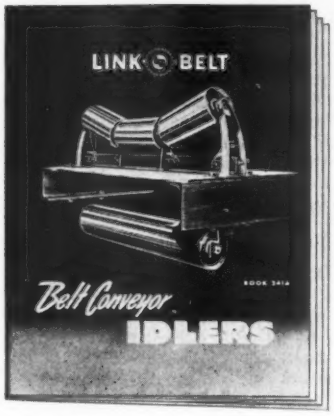
Files and Tools made by the Heller Brothers Co., Newcomerstown, Ohio, are attractively displayed in this series of new catalogs. In the upper-left corner is the new Heller Swiss Pattern file catalog now in production. The other 6, already in print, describe Nucut American Pattern files, Vixen Milled Curced Tooth files, American-Swiss Swiss Pattern files, American-Swiss American files and Heller tools. In the center is the handy 64-page full-line file catalog.

Circle Inform-A-Gram No. B7.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

More Than 500 Belt Conveyor Idlers in 34 types, designed to meet practically every requirement, are pictured and described in a new 48-page Booklet No. 2416, just released by Link-Belt Co., 307 N. Michigan



Ave., Chicago 1, Ill. Detailed information is provided for selection and spacing, based on weight and lump size of material to be conveyed. Schematic drawings and dimensional data also included.

Circle Inform-A-Gram No. B8.

Bijur Lubricating Corp., Rochelle Park, N.J., has just published a new bulletin on the operation and application of the company's new "E" Solenoid-Operated Lubricator. The new unit as described in Bulletin NB-11 is readily adaptable to many types of machines and offers wide flexibility of controls, for automatic lubricating systems.

Circle Inform-A-Gram No. B9.

A pocket-sized reamer selector that lists 143 hole sizes from 0.4000 through 0.5010 inch which can be reamed with standard Lavallee & Ide reamers is now available from Lavallee & Ide, Inc., Chicopee. Mass. The selector includes catalog number and equivalent sizes for easy ordering.

Circle Inform-A-Gram No. B10.

A New Furnace and Oven Control Instrument Catalog has just been published by the Bristol Co., Waterbury, Conn. In addition to numerous photographs featuring electronic Dynamaster potentionometer and millivoltmeter type pyrometer controllers, recorders and indicators, the catalog is liberally illustrated with diagrams of the various furnace control arrangements and dimension sketches.

Circle Inform-A-Gram No. B11.

A Lubricant for Tough Tapping Operations has been developed by the Van Staaten Chemical Co., 546 W. Washington Blvd., Chicago 6. Ill. Several field research engineering reports are available showing where use of its Vantrol lubricant extends tap life, reduces heat and breakage and improves thread finish in materials as tough as cast armor plate.

Circle Inform-A-Gram No. B12.

Airelectric Corp., P.O. Box 208, Melrose Park, Ill., has announced a new line of 4-way valves for operation of pneumatic and light hydraulic cylinders in literature now available. These valves are of D-slide type, with the port-exchanger slide being operated by a double acting cylinder in one series and by a spring return cylinder in another series.

Circle Inform-A-Gram No. B13.

INGERSOLL'S *New*

CUTTER CATALOG

INSERTED BLADE MILLING, AND BORING TOOLS

Important recent advances in tool design have made necessary a complete revision of the Ingersoll cutter catalog. The 1953 edition includes extensive material on carbide milling of steel, as well as new information on the proper selection of tools, cutting methods, and cutter grinds for all kinds of work.

Ingersoll cutter designs are constantly being improved to meet requirements of the heavier, faster acting, more powerful machine tools being built today. The knowledge we gain in designing Ingersoll production equipment for a wide variety of work enables us to recommend the proper cutters for all types of machines and materials.

WRITE FOR CUTTER CATALOG 60H

THE INGERSOLL MILLING MACHINE CO. ROCKFORD, ILLINOIS

Automatic Turret Lathes by Potter & Johnston Co., Pawtucket, R. I., are the theme of the firm's Bulletin No. 145. Detailed photographs and specifications make up the discussion on the lathes.

Circle Inform-A-Gram No. B14.

Planers, Planer - Millers, Vertical Boring and Turning Mills, and horizontal boring, drilling and milling machines, plus a complete line of accessories and tooling are described and well-illustrated in a new brochure offered by the Giddings & Lewis Machine Tool Co., Fond Dulac, Wis.

Circle Inform-A-Gram No. B15.

The New Line of Multiple Spindle Drill Heads, produced by the Durant Tool Supply Co., 155 Orange St., Providence 3, R. I., is illustrated and described in the firm's latest released brochure.

Circle Inform-A-Gram No. B16.

Exclusive Advantages of the Openside Hy-Draulic Shaper are revealed in a brightly illustrated brochure readily available from the Rockford Machine Tool Co., Rockford, Ill. Among the features described are uniform cutting speed, stepless adjustment of speeds and feeds and quick reversals with high return ratios.

Circle Inform-A-Gram No. B17.

INDI-AC Solves Wide Variety of Gage-Checking Problems at THE PIPE MACHINERY COMPANY

THE GAGE DIVISION of The Pipe Machinery Company, Wickliffe, Ohio, makes a wide variety of standard and special gages. To get the versatility, sensitivity and dependable accuracy required for checking these gages, this company uses the INDI-AC Electronic Indicator. Here are two typical applications:

Fig. 1. Checking a large ring thread gage. The Indi-Ac head is used upside down as shown to find the high point of the pilot ID, and is used in normal position to find the low point. The stack of gage blocks furnishes a reference for each of these points. Thus the inspector readily checks the ID for size.

The Indi-Ac is also used for checking the thread diameter, the concentricity of thread and pilot, and the roundness at four points around the gage. All dimensions are checked after each grinding and lapping operation—quickly and dependably.

Fig. 2. Checking a master taper plug gage. The plug is on a sine bar; and the inspector explores the top surface line with the Indi-Ac to check straightness and taper. Tolerance is only .0001" per inch.

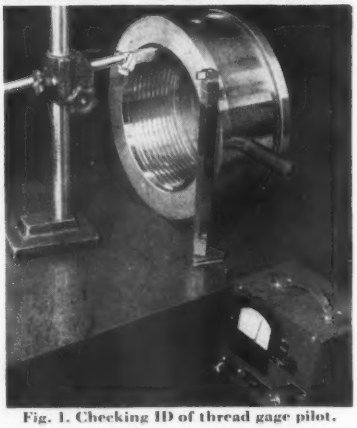
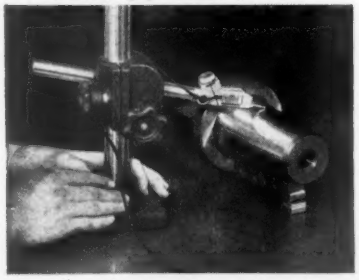


Fig. 1. Checking ID of thread gage pilot.

Fig. 2. Checking straightness and taper of master gage to .0001" per inch.



The Pipe Machinery Company has top-quality gaging equipment of many makes and types, and finds that the Indi-Ac is the most practical instrument for these and many other jobs.

THE INDI-AC gives consistent repeat readings, with instantaneous meter response. It is rugged; portable; quick and simple to set up. Has two magnifications, used interchangeably at will: .0005"/.000050" or .0001"/.000010" per scale division, depending on the amplifier selected.

FREE INDI-AC BULLETIN gives full details. Write for a copy.

AND ASK about the PAR-AC Electronic Production Gage; MICRO-AC Electronic Microcomparator.

P.S. Cleveland gage heads and amplifiers are also used with recording equipment, with special gaging fixtures, and as the heart of automatic gaging and sorting equipment. We invite your inquiries.

Designed, developed and manufactured by

CLEVELAND INSTRUMENT CO.

Formerly Graham-Mintel Instrument Co.

739 CARNEGIE AVE. CLEVELAND 15, OHIO

Ball Bearings and Roller Bearings are illustrated and described in a brochure recently released by the Morton Bearing Co., 815 Wildt St., Ann Arbor, Mich.

Circle Inform-A-Gram No. B18.

Morey No. 2, 3 and 4 Turret Lathes are reviewed in an illustrated brochure now available from the Morey Machinery Co., 410 Broome St., New York 13, N. Y. Specifications of machines are among some of the valuable data presented.

Circle Inform-A-Gram No. B19.

Metalloid Water-Oil Soluble Bulletin. This four-page folder describes applications and methods for use of the new Dynatomics water-and-oil soluble metal cutting fluid, Metalloid WOS. It is available from Metalloid Corp., Huntington, Ind.

Circle Inform-A-Gram No. B20.

Light-Weight Processing and Heat Treating Equipment are the subjects of the Pressed Steel Co., Wilkes-Barre, Pa., brochure now available. This catalog has a wealth of fabrication know-how for solving specification and design problems.

Circle Inform-A-Gram No. B21.

Diamond Wheels are the topic of discussion in a recent publication offered by the Diamond Tool Research Co., Inc., 305 E. 45th St., New York 17, N.Y. Specifications on 10, 11 and 12" diameter diamond wheels are featured in the pamphlet.

Circle Inform-A-Gram No. B22.

An Entirely New MC-Universal 12" Acme - Gridley single - spindle automatic chucking machine has been announced by the National Acme Co., 170 E. 131 St., Cleveland, Ohio. Specifications and other data on this new machine now available.

Circle Inform-A-Gram No. B23.

With Vacuum Furnaces rapidly moving out of the laboratory into commercial use, a new folder just issued by the F. J. Stokes Machine Co., Vacuum Equipment Div., 5500 Tabor Rd., Philadelphia 20, Pa., is particularly timely. This 4-page bulletin discusses in some detail a number of processes which are being carried out in 3 types of vacuum furnaces now being built.

Circle Inform-A-Gram No. B24.

The Onsrud Model A-72 InvOmil, a profile milling machine for high spindle speed and high nonferrous metal milling, is throughly described in a new 16-page bulletin just published by the Onsrud Machine Works, Inc. 3941 Palmer St., Chicago 47, Ill. Of particular interest will be the detailed series of illustrations showing how the InvOmil Head feeds during milling operations. ,

Circle Inform-A-Gram No. B25

The Econaway Abrasive Belt Splicer is described in Bulletin 310 issued by Aget-Detroit Co., Ann Arbor, Mich. The circular contains specifications and illustrations of the simplified method for making up joined belts ready to use from paper or cloth backed abrasive in roll form.
Circle Inform-A-Gram No. B26.

The Landis 12" x 28" Universal and Tool Grinder is described and illustrated in the firm's new 24-page catalog which is now available. The catalog contains 52 photos which illustrate the machine, operating features, equipment and typical grinding operations. Also included are specifications and equipment lists. Write to Landis Tool Co., Waynesboro, Pa.
Circle Inform-A-Gram No. B27.

Machine Tools and Accessories, made by the Morey Machinery Co., Inc., 410 Broome St., New York 13, N. Y., are displayed in the firm's Catalog 270. The large booklet contains information such as specifications and spindle speeds of most all of the many machines that Morey makes.
Circle Inform-A-Gram No. B28.

Sciaky Electronic Timers are used for split timing of many industrial and professional operations. Their ranges are from 0 to 24 seconds. Bulletin No. 315-10 describes the advantages in the design and operation of the timers plus complete specification of the most widely used models. Write to Sciaky Bros., Inc., 4915 W. 67th St., Chicago 38, Ill.
Circle Inform-A-Gram No. B29.

Precision Measuring Instruments made by Tubular Micrometer Co., St. James, Minnesota, are described in detail in the firm's Catalog 22. In more than 200 pages, Tubular gives you everything from instructions on how to read a micrometer to the various methods of measuring screw threads on the pitch diameters. The booklet is liberally sprinkled with illustrations and tips on how to use the delicate measuring tools.
Circle Inform-A-Gram No. B30.

Cone-Drive Gears Serve Industry "Across the Board." The extent to which double-enveloping worm gearing has helped improve design. Performance and service life of all types of equipment in recent years is profusely illustrated in a 36-page, 2-color booklet now available from Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. "Bulletin CD-173" documents 93 successful applications in 20 different industrial classifications from agricultural equipment to zinc mining.
Circle Inform-A-Gram No. B31.

A New Ettco Emrick Bulletin on well-balanced, visible grip tap holding chucks, giving sizes, capacities and part designations and describing features of this tool, is now available from Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y.
Circle Inform-A-Gram No. B32.

Keying and Pinning devices for production assembly are displayed in a new illustrated circular put out by the John Gillen Co., Inc., 2540 S. 50th Ave., Cicero 50, Ill. Machine keys, taper pins, groove pins and woodruff keys are among the items discussed.
Circle Inform-A-Gram No. B33.

A New Universal Box Angle, which combines the advantages of a box parallel, a right angle iron and an angle plate, has been developed by Challenge Machinery, Grand Haven, Mich. Descriptive literature on this new "3 in 1" tool is available.
Circle Inform-A-Gram No. B34.

A Patented Process of Bonding Metals by means of a synthetic resin adhesive is comprehensively explained in a new brochure available from Ciba Co., Inc., Plastics Div., 627 Greenwich St., New York 14, N. Y. Outstanding properties, application and bonding process information included in the booklet.
Circle Inform-A-Gram No. B35.

Sid Tool Company

WHY WAIT FOR SPECIAL TAPS?

. . . Has them IN STOCK for IMMEDIATE DELIVERY!

HIGH SPEED | SPECIAL | RIGHT HAND TAPS

SIZE	THREAD	SIZE	THREAD	SIZE	THREAD
4	32-48-60-64	3/8	12-16-18-20-27-28-32-36-40-48	1-3/4	8-10-12-14-16-18-20-24
5	30-32-36-48-80	7/16	12-16-18-22-24-27-28-30-32-36-40	1-13/16	8-10-12-14-16-18-20
6	36-40-48-56-60	1/2	12-14-16-18-22-24-26-27-28-30-32-40	1-7/8	8-10-12-14-16-18-20-24
7	32-40	9/16	16-20-24-27-28-30-32-40-48	1-15/16	8-10-12-14-16-18-20-24-28
8	24-30-36-38-40-44-48	5/8	12-14-16-20-24-27-28-32-36-40	2	4-1/2-8-10-12-16-18-20
9	24-28-32-40	11/16	11-16-18-20-24-27-28-30-32	2-1/16	12-14
10	28-30-36-40-48-64	3/4	9-11-12-14-18-20-24-26-27-28-32	2-1/8	12-16-20
12	20-28-32-36	13/16	10-14-18-20-32	2-3/16	12-16
14	20-24-28	7/8	10-12-16-18-20-24-27-28-32	2-1/4	4-1/2-8-12-14-16-18
1/16	60-64	15/16	8-9-10-12-14-16-18-20-24-32	2-5/16	12-18
5/64	72	1	10-12-16-18-20-24-27-32-40	2-3/8	12-16-18
3/32	48	1-1/16	12-14-16-18-20-24	2-1/2	8-10-12
7/64	48-56	1-1/8	8-10-14-16-18-20-24-32	2-9/16	18
1/8	32-40	1-3/16	8-10-12-14-16-18-20-24	2-5/8	12-16-20
5/32	32-36-40	1-1/4	8-10-14-16-18-20-24-32	2-3/4	16
9/64	36-40	1-5/16	12-14-16-18-20-24-32	2-7/8	8-12-18
11/64	36	1-3/8	8-10-14-16-18-20-24	3	8-16
3/16	20-24-32	1-7/16	8-10-12-16-18-20-24	3-1/4	8-12-16
13/64	32	1-1/2	8-10-14-16-18-20-24-28	3-1/2	8-12-16
7/32	24-28-32	1-9/16	18-20-24	3-7/8	8
1/4	18-24-26-27-30-32-36-40	1-5/8	5½-8-10-12-13-16-18-20-24	4	8-12
5/16	16-20-22-27-28-32-40	1-11/16	10-12-14-16-18-20-24		

HIGH SPEED LEFT HAND TAPS

SIZE	THREAD	SIZE	THREAD	SIZE	THREAD
0	80	3/8	16-24-32	1-3/8	6-8-10-12-16-18-20-24
1	56-64-72	7/16	14-20-28	1-7/16	8-10-12-14-16-18-20
2	56-64	1/2	12-13-20-28	1-1/2	6-8-10-12-16-18-20
3	56	9/16	12-18-20-24	1-9/16	8-10-12-16-18-20
4	32-36-40-48	5/8	11-12-18-20-24	1-5/8	8-10-12-14-16-18-20
5	40-44	11/16	11-16-24	1-11/16	8-10-12-14-16-18-20
6	32-36-40	3/4	10-16-18-20	1-3/4	8-10-12-14-16-18-20
8	32-36-40	13/16	16	1-13/16	8-10-12-14-16-18-20
10	24-30-32-40	7/8	9-12-14-18-20	1-7/8	8-10-12-14-16-18-20
12	24-28-32	1	8-12-14-16-18-20	1-15/16	8-10-12-14-16-18-20
1/4	20-28-32	1-1/8	7-12	2	4½-10-12
5/16	18-20-24-28-32	1-1/4	7-12-16-18		

• SPECIAL AND LEFT HAND DIES IN STOCK

Prices on Application — We are always adding new sizes

NOTE: Oversize - Undersize - Metric - 64th and 32nd Size Taps Available for Quick Delivery.

Dealer Inquiries Invited

• Are you on our monthly mailing list? Write Dept. T

SID TOOL COMPANY, INC.
CUTTING TOOL SPECIALISTS
126 LAFAYETTE STREET • NEW YORK 13, N. Y.
PHONE: BE 3-4270

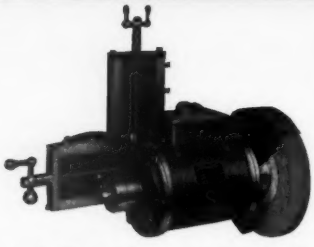
Drill Extensions and Chucks made by the Beaver Tool Co., 622 E. Jericho Tpke, Huntington Station, N. Y., are illustrated and described in new brochure. These extensions are said to eliminate special length drills.
Circle Inform-A-Gram No. B36.

Industrial Filtration Equipment made by the U. S. Hoffman Machinery Corp., Thompson Rd., Syracuse 6, N. Y., is graphically presented in an 8-page brochure put out by the company. Essential features and applications of the firm's 10 basic types of industrial filtration equipment are highlighted.
Circle Inform-A-Gram No. B37.

A New Pocket Catalog of Handling Equipment presents a comprehensive line for the "floor level" handling of goods and materials. Just released, this Junior Catalog No. 535 will be mailed upon request by Barrett-Cravens Co., 4609 S. Western Blvd., Chicago 9, Ill.
Circle Inform-A-Gram No. B38.

The Electrostake is an improved, all electric staking machine which features lightning-fast solenoid operation. Its many construction advantages are pointed out in a new brochure, yours for the asking from Black & Webster, Inc., 445 Watertown St., Newton 58, Mass.
Circle Inform-A-Gram No. B39.

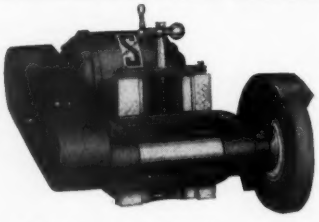
it's STANDARD for Motorized Spindles



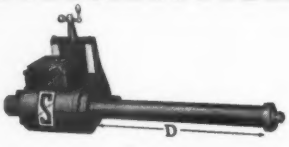
Angle Plate Grinder with horizontal and vertical feeds. ¼ to 10 H.P.

Vertical Spindle Grinder with or without feeds. ½ H.P. to 50 H.P.

"A" dimension to order up to 16". For Planer, Boring Mill, Surface Grinder, Milling Machine.



Belt Driven Lathe Grinder. ¼ H.P. to 20 H.P.



Internal Grinder, direct motor drive. Grind up to 30" deep. ½ to 5 H.P.

Belt Driven Internal Grinder. Grind up to 24" deep. ¼ to 5 H.P.

Vertical Spindle Grinder, belted motor drive, ½ to 5 H.P.

B = Adapter to fit in ram of Boring Mill.

Write for Catalog 44

THE STANDARD ELECTRICAL TOOL CO.
CINCINNATI 4, OHIO

See these machines in operation; National Metal Exposition, Cleveland; Oct. 19-23, Booth 840.

The Budd-Ranney Automatic Bar Machine, especially designed for producing nut-blanks from bar stock, is the subject of a circular now available from The Miller Glass Engineering Co., 148 S. Glenwood Ave., Columbus 8, Ohio. Elaborated on in the literature are the machine's outstanding design features, size and general construction, tooling, and chuck mechanism.
Circle Inform-A-Gram No. B40.

Shear-Speed Soluble Oil for broaching, hobbing, drilling, turning and grinder applications are explained in full in some new literature offered by Shear-Speed Chemical Products Div. of Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich. Four major features of this "coolant-lubricant" are also described.
Circle Inform-A-Gram No. B41.

Pratt & Whitney Cutting-Off Blades are fully treated in a new brochure recently released by the company. Included in the literature are complete specificational data plus illustrated descriptions of these and other P & W cutting tools. Write to Pratt & Whitney, West Hartford 1, Conn.
Circle Inform-A-Gram No. B42.

The Grav-I-Flo-Tumbling Process employs the use of newly developed materials which cut fast and produce a superior finish with a smoother and higher lustre on metal parts. Information on this process with illustrations of the tumbling machines is available from The Grav-I-Flo Corp., Dept. 0000, 400 Norwood Ave., Sturgis, Michigan.
Circle Inform-A-Gram No. B43.

Standard Solid High Speed Steel Milling Cutters and End Mill Holders are the subjects of a new 52-page descriptive catalog being distributed by Goddard & Goddard Co., P. O. Box 68, Brightmoor Station, Detroit 23, Mich. Covering a recent addition of 147 different sizes to its standard end mill line, the catalog also contains such new developments as the heavy duty end mill adapter, its auxiliary equipment and a quick change shell end mill adapter.
Circle Inform-A-Gram No. B44.

"Push-Button" Drilling and Reaming. A new power-source for operating drills and cutting tools is "Drillunit." A recent catalog-folder, now available, gives photos of single and multiple installations, plus specifications and other informative data. The Drillunit is a small self-contained unit incorporating motor driven spindle with hydraulic feed. It can be mounted on a machine in any position. It weighs only 175 lbs, and has few parts. For literature, write to Drillunit, Inc., 635 Mt. Elliott, Detroit 7, Mich.
Circle Inform-A-Gram No. B45.

The Wotan 3" Horizontal Boring and Milling Machine (Model B-3) is the subject of an illustrated brochure offered by The Parker Machine Co., Inc., 158 Pioneer St., Brooklyn 31, N. Y. Main features and data on various intricate parts of the machine are presented.
Circle Inform-A-Gram No. B46.

Production Screwdriving Tools are the subject of a new 60-page catalog just issued by the Apex Machine & Tool Co., 1068 S. Patterson Blvd., Dayton 2, Ohio. The circular contains illustrations and specifications of Apex bit holders, insert bits, power bits, hand drivers, offset drivers and finder sleeve assemblies.
Circle Inform-A-Gram No. B47.

Michigan Bench-Type Gear Rolling Fixtures for accurately checking size, eccentricity and smoothness of external and internal spur and helical gears are illustrated and described, including specifications, in literature now available from Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Circle Inform-A-Gram No. B48.

Synthane Tubes and Rods belong to a family of plastics known as the laminated thermoseting group. Once processed (polymerized), they cannot be resoftened by any ordinary reapplication of heat. A complete explanation on how Synthane Tubes and Rods are made is presented in a circular being distributed by the Synthane Corp., Oaks, Pa.
Circle Inform-A-Gram No. B49.

Portable Electric Power Tools are the subject of a new 40-page illustrated catalog recently released by the Thor Power Tool Co., 175 N. State St., Aurora, Ill. The No. 39-A bulletin gives complete descriptions and specifications of all Thor universal electric industrial and automotive tools.
Circle Inform-A-Gram No. B50.

The Nebel 'LN' Series Engine Lathe is being modified and will boast of being bigger, more powerful and better looking. It also will have a heavier apron and carriage, quick change gear box and other new features. Literature on the redesigning of this machine available from The Nebel Machine Tool Co., Cincinnati 25, Ohio.
Circle Inform-A-Gram No. B51.

The New Adjustable Speed Drive on Rogers "Perfect 36 Vertical Turret Mills" is explained in full in a bulletin just off the presses. The adjustable speed drive provides unlimited table chuck speeds up to 212 rpm. The bulletin is printed by the Rogers Machine Works, 1400 Seneca St., Buffalo 10, N. Y.
Circle Inform-A-Gram No. B52.

The A. K. Allen Co., 57 Meserole Ave., Brooklyn 22, N. Y., announces the issuance of its latest catalog on Allen air valves and clamps. The new catalog shows the complete line and replacement parts and is illustrated with photos and drawings.
Circle Inform-A-Gram No. B53.

The 418 Cylindrical Grinder, made by the Van Norman Co., Springfield 7, Mass., is described in a recent bulletin put out by the company. The circular illustrates the grinder and its numerous operating advantages. It contains complete specifications of the grinder and includes a floor plan.
Circle Inform-A-Gram No. B54.

The Locating Spotlight, which enables production machine operators to accurately position work in blind operations, is adequately covered in Bulletin #309-10 available from Sciaky Bros., 4915 W. 67th St., Chicago, Ill.
Circle Inform-A-Gram No. B55.

A New Flexible Metal Hose Bulletin has just been issued by the Atlantic Metal Hose Co., Inc., 123 W. 64th St., New York 23, N. Y. It contains illustrations of the company's line of high pressure interlocking bronze and steel flexible hose, tar and asphalt hose, loading and unloading and necessary couplings.
Circle Inform-A-Gram No. B56.

SERVING "INDUSTRY" FOR OVER 30 YEARS

RELY ON Morton MANUFACTURERS OF HIGH QUALITY FIXTURE CLAMPS AND COMPONENTS

WRITE TODAY for your copy of this instructive Catalog.

- MORTON'S products are built for STAR performance.
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- SAVE by using them as STANDARDS. There's a size and type to fit your most rigid requirements.
- Highest quality of workmanship and materials maintained.
- IMMEDIATE DELIVERY on Standards . . . Standards can be modified to suit your application.
- Your Tool Stores should have a representative stock of all MORTON'S details. Individual parts or complete assemblies.
- Illustrative Catalog containing full size templates of each product for tracing into your design.

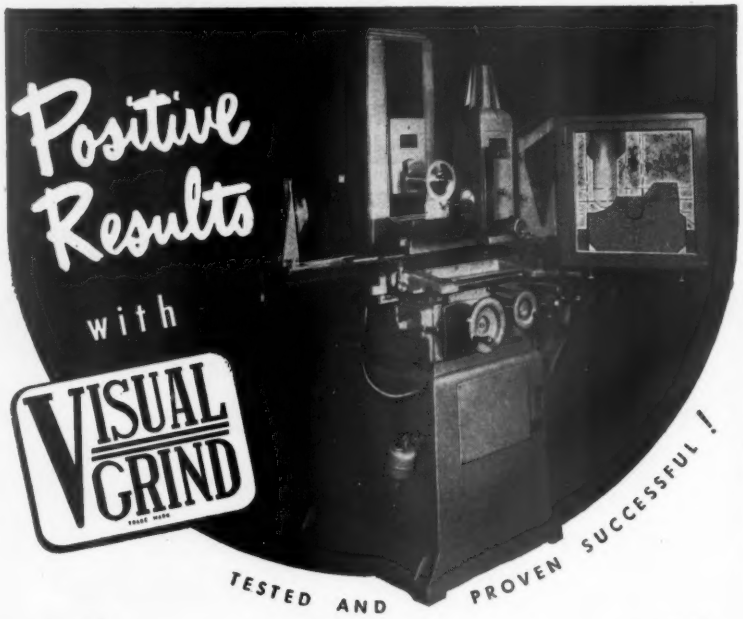
MORTON MACHINE WORKS
2425 WOLCOTT ST. DETROIT 20, MICH

Flexoid Silentbloc Couplings are described in detail in literature being offered by the Flexoid Coupling Co., Division of the Smith Power Transmission Co., 1545 E. 23rd St., Cleveland 14, Ohio. These couplings are electrically insulated and are flexible in operation.
Circle Inform-A-Gram No. B57.

Dimensions, Tolerances and drawings of all standard drill jig bushings and liners with measurements in table form for all sizes are included in Colonial's latest net price list. Write to Colonial Bushings, Inc., 31780 Groesbeck Highway, Fraser, Mich.
Circle Inform-A-Gram No. B58.

Portable Electric Tools, manufactured by the Black & Decker Co., Towson 4, Md., are described in the firm's 1953 standard catalog. Such tools as ball bearing drills, hole saws, tapguns and adjustable clutch drives are illustrated and described.
Circle Inform-A-Gram No. B59.

High Speed Automatic Cycle Metal Turning reaches a higher development in the Monarch Mona-Matic Air-Gage Tracer. The outstanding features of this machine plus information on various models and applications, are ably described in new brochure available from The Monarch Machine Tool Co., Sidney, Ohio.
Circle Inform-A-Gram No. B60.



Progressive Die

Blanking Die

Here is precision contour grinding at its best. Steel and tungsten carbide form tools, die sections, templates and related items are efficiently processed in dependable, economical fashion. Our basic magnetic chuck work-holder affords positive positioning yet with flexibility for cam, circular and index grinding with the proper fixtures. Work-piece quality is controlled visually at all stages, either while using pre-dressed grinding wheels or when generating the required contour by means of successive, controlled movements. Durable construction around precision optics insures rigidity and long life.

Ask for Bulletin T-10

Flat Form Tool

Circular Form Tool

Dovetail Tool

VISUAL GRIND THE CLEVELAND GRINDING MACHINE COMPANY
1643 EDDY ROAD • CLEVELAND 12, OHIO
New Possibilities in Optical Grinding

Hydraulic Tracing Attachments for J & L turret lathes are fully described with illustrations, detailed diagrams and specifications in the latest folder yours for the asking from Jones & Lamson Machine Co., Springfield, Vt.
Circle Inform-A-Gram No. B61.

Outstanding Heat-Treating Installations are illustrated and described in a new 8-page, 2-color brochure available from Lee Wilson Contracting Co., 20005 W. Lake Rd., Cleveland 16, Ohio. Shown are more than 14 gas, oil and electric heating furnaces.
Circle Inform-A-Gram No. B62.

For Selecting Industrial Adhesives, Coatings and Sealers, a handy new guide is now available from the Adhesives and Coating Division of the Minnesota Mining and Mfg. Co., 423 Piquette Ave., Detroit 2, Mich. The two-color, 8-page bulletin lists the most important adhesives, coatings and sealers which 3M produces.
Circle Inform-A-Gram No. B63.

Valves for the Control of Single and Double Acting Air Cylinders are graphically displayed in Catalog 53, an attractive brochure offered by Mechanical Air Controls, Inc., 15311 W. 11 Mile Rd., Detroit 37, Michigan. Booklet contains many diagrams, illustrations and specifications on Mechanical Air Control products.
Circle Inform-A-Gram No. B64.

"Grits and Grinds," a technical magazine devoted to the interest of better grinding, lapping and surface finishing, has two very informative items in its editorial on safe grinding in the home and the mysterious cause of certain chatter marks. Write for No. 5, Volume 44 publication to Norton Co., 3 New Bond St., Worcester 6, Mass.
Circle Inform-A-Gram No. B65.

Barnaby Self-Closing Knurling Tools. A supplementary bulletin describes these tools, giving sizes, dimensions and prices. The bulletin explains how the Barnaby Knurling Tool cuts set-up time to a minimum and elaborates on the exact workings of the tool. Write to Barnaby Mfg. Co., Inc., 74 Knowlton St., Bridgeport 8, Conn.
Circle Inform-A-Gram No. B66.

The Emco Bench Type Power Punch Press will punch, within its capacity, any metal that can be pierced and can be used for other operations such as forming, stenciling and riveting. The Klaas Machine & Mfg. Co., 4314 E. 49th St., Cleveland 9, Ohio, producers of the press, has prepared an interesting brochure on the Emco "W" and "X" models.
Circle Inform-A-Gram No. B67.

Outstanding Features of P & W's Air-O-Limit Comparator, Model G, are discussed in a recent bulletin published by Pratt & Whitney, West Hartford 1, Conn. Pictures and diagrams aid in giving a detail explanation of this air gage.

Circle Inform-A-Gram No. B68.

Bryant Air Dryers for humidity reduction, humidity control and corrosion and mildew control are explained in two new attractive brochures now available from Tomlinson Steam Specialty Co., 1599 St. Clair Ave., Cleveland 14, Ohio. How the dryers work and what they do are the essential facts presented in these brochures.

Circle Inform-A-Gram No. B69.

"Eleven Ways to Cut Production Costs" is the title of a popular booklet put out by the Alemite Div., Stewart-Warner Corp., 1850 Diversey Parkway, Chicago 14, Ill. Contains all information on reorganization of lubrication in your plant for maximum economy.

Circle Inform-A-Gram No. B70.

Technical Data on M & W Water Dip #33 is now available from the Maas & Waldstein Co., 2121 McCarter Highway, Newark, N. J. Water Dip #33 is a treatment for metals to preserve the chemically clean surfaces obtained directly after electro-plating or a chemical cleaning operation.

Circle Inform-A-Gram No. B71.

"Put Sub-Zero to Work" is the title of an illustrated brochure on chilling machines distributed by Sub-Zero Products, Reading Rd., at Paddock, Cincinnati 29, Ohio. The circular gives detailed descriptions of both the standard Sub-Zero chilling machine and those built for special applications.

Circle Inform-A-Gram No. B72.

The Advantage of Using Steel Weldments is outlined in a new 16-page bulletin published by Struthers Wells Corp., Titusville, Pa. Also included is a technical section on weldment definitions, comparative properties and advantages of steel vs. cast iron and general data showing weldability of ferrous metals.

Circle Inform-A-Gram No. B73

Five Illustrated Broaching Application articles, featuring interesting broaching machine set ups and incorporating automation, can be found in the latest 8-page 2-color edition (Vol. XV, No. 1) of the Colonial Broaching News, now available from Colonial Broaching Co., P. O. Box No. 37, Harper Station, Detroit 13, Mich. Included, are broaching applications of tractor track roller shafts, jet engine parts, automotive rocker arms, machine gun barrels and bushings.

Circle Inform-A-Gram No. B74

Engineering Data on Wrought 35 NI-15CR Alloy plus a brief summary on other useful heat resisting alloys is presented in a circular offered by Rolled Alloys, Inc., 4815 Bellevue Ave., Detroit 7, Mich.

Circle Inform-A-Gram No. B75.

A New Illustrated Bulletin giving complete specifications on a line of heavy duty swivel angle plates, rotary swivel angle tables, universal adjustable precision angle tables and multi-angle jigs, all imported from England, is available upon request from DeWitt Equipment Co., 136 Lafayette St., New York 13, N. Y.

Circle Inform-A-Gram No. B76.

A New Catalog on B-Right-On Socket Screw Products is now available from Brighton Screw & Mfg. Co., 1841 Reading Rd., Cincinnati 2, Ohio. One section of this report is devoted to technical engineering data or the use of socket screws.

Circle Inform-A-Gram No. B77.

Tuthill Small Industrial and General Purpose Pumps are featured in two new catalogs being offered by Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill. A feature of these catalogs is the unique pump guide included which presents the services, operating data and advantages for each model. **Inform-A-Gram No. B78**

DAKE PRESS REPLACES THE "HERNIA METHOD" OF KNOCKING OUT DIE INSERTS

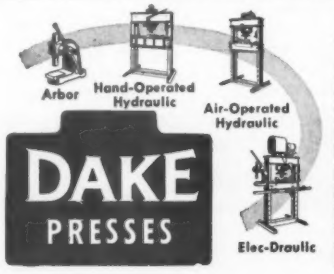
The job of knocking out forging die inserts formerly required two men, and sometimes several hours of hand sledging. Now one man does it easily in a few minutes with a Dake 125-ton Air-hydraulic Press.

The die and drive pin are placed under the press ram as shown, and pressure is applied up to the 125-ton capacity. If pressure alone fails to break the insert loose, heat is applied around the die until expansion permits breakaway, which comes with a sudden impact under the sustained high pressure.

Savings in labor costs have been tremendous, and labor relations have been greatly improved.

Dake Hydraulic Presses have scores of uses in industry. A variety of styles and capacities makes them adaptable to almost any requirement. We suggest that you contact your nearest Dake representative about your pressing problems—or write us and we will ask him to call.

Dake Engine Company, 634 Seventh St., Grand Haven, Mich.



Send for Big New Catalog

DAKE ENGINE COMPANY
634 Seventh St., Grand Haven, Mich.
Please send me a copy of Dake Catalog No. 129

Name _____

Company _____

Address _____

City _____ Zone _____ State _____

New Job Lapping Department

To further advance improvement of product performance in the metals industry through greater use of precisely lapped parts, Norton Company's Grinding Machine Division at Worcester, Mass., announces the establishment of a new department.

Called the Norton Job Lapping Department, the Company has now broadened its lapping capacity to handle a multitude of job lapping projects.

Expanded facilities in this new department include machines for:

1. Single and parallel face-bonded abrasive and loose abrasive lapping.
2. Single and parallel face-flat lapping.
3. External cylindrical lapping jobs for high precision requirements.
4. Flat work up to 24" across with larger sizes possible by special arrangement.
5. Cylindrical work from 1/16" diameter by ½" long, to 2" diameter by 8" long.

The materials that can be lapped are practically unlimited.

A controlled atmosphere is provided to assure production of the finest quality product. The machines are operated by highly skilled personnel whose work is checked by the most modern electrical and optical inspection equipment.

Direct supervision of this expanded activity is by lapping engineers who pioneered the process of mechanical lapping and developed the line of lapping machines.

THE HAMILTON
PORTELVATOR®
(Portable Elevating Table)
MAKES IT Easy TO LIFT • LOWER LEVEL • TRANSPORT LOADS UP TO 5,000 lbs.

3 TABLE SURFACES
Can be worked at from ALL 4 SIDES
Slow or fast lift.
Self locking at any height.
4 POINT SUPPORT
(table can't tip)
Lift mechanism can be operated from either end.
Turns easily on anti-friction casters. Positive floor lock.
WELDED CONSTRUCTION
Mechanical lift through worm, worm gear and screw.
TABLE CAN'T SETTLE
*THREE STANDARD MODELS TO CHOOSE FROM

STYLE "A" (Illustrated)*
Max. Height 40" Min. Height 25" Length 33" Width 21" Weight 225 lbs.
Capacity 2,000 lbs. (plus safety factor)
FURNISHED ON ORDER
SAF-T-RAIL — Guard rail fits either top or middle table.
ROLLER CONVEYOR TOP • RUBBER TIRED WHEELS

GET THE DETAILS WRITE FOR BULLETIN P-5247

THE Hamilton TOOL COMPANY
832 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

New Micromatic Tool Hones & Gages 280mm Atomic Gun Barrel

With the successful testing of the new 280 mm atomic gun on the firing range, Micromatic Hone Corporation, is releasing details on its 69-foot long tool which is used to Microhone the bore of the gun barrel.

Designed and built by Micromatic, the tool has a gage in its nose, making it possible to check the diameter of the bore at any point throughout its full length, without removing the tool from the bore, or the barrel from the machine. This new tool is reducing by 80% the time that the barrel is at the Microhoning machine.

Photo Courtesy Micromatic Hone Corporation.

After the barrel has been Microhoned to remove all rings, steps, and geometric inaccuracies resulting from previous operations, the diameter is checked in 30 seconds, by means of dials, at a conveniently located control station. The 33-foot long barrel

can be checked completely, within .0003 inches tolerance, in just a few minutes; previously, large gun barrels of this type required a full day for the checking operation. The distance from the muzzle end to the point where the diameter is being checked is also indicated on dials.

Because Microhoning simplifies processing, all types and sizes of gun barrels are now being Microhoned before the rifling is cut. With an accurate surface, there is less chance of damaging the rifling broach or scrapping the barrel. The Microfinish surface assures a tight seal between the barrel and the projectile, maintaining both the full force of the explosion and the accuracy of the gun.

Other parts of large guns which are Microhoned include the cylinders and rods of the recoil, recuperator, and body mechanisms, plus components of the breech assembly.

Steel Samples Conveyed by Pneumatic Tubes

Traveling faster than a man can run, open hearth steel samples now speed from furnace to laboratory — a distance of about a tenth of a mile — in less than 20 seconds via pneumatic tubes at the Roebling, N.J. steel mill of the John A. Roebling's Sons Corporation.

The newly - installed system simplifies the problem of maintaining a consistently high-quality steel because several samples may now be checked in the time it formerly took to check one, thus permitting more frequent quality-control checks. The pneumatic tube system will step up the overall steel production, and also cut out a sizable amount of human drudgery.

Similar in operation to the pneumatic tubes used by some large department stores for handling cash between points of sale and a central cashier's office, the installation at the Roebling plant is not unique in the steel industry, but it is believed to be the first used in a closely-integrated operation such as Roebling's, with lab directly adjacent to the open hearth furnaces.

The three - inch pneumatic tubes, installed by the Lamson Corporation, Syracuse, service all nine open hearth furnaces at the Roebling mill. Steel samples may be sent directly from any one of the furnaces to the lab, analyzed in two or three minutes and then returned, seconds later, to one of three pick-up points, complete with carbon analyses. This enables melters to handle a greater number of furnaces with much less physical fatigue.

Because of precision control throughout its manufacturing operations, the John A. Roebling's Sons Corporation, recently acquired by CF&I, has built an enviable reputation for high quality in its diversified line of electrical wire and cable, cold rolled strip, round, flat and shaped wires, wire rope and strand, etc.

Installation of the new pneumatic tube sampling system is part of a broad program of expansion and modernization of present facilities currently taking place throughout the 12 plants of Colorado Fuel and Iron, which now has the ninth largest steel producing capacity in the U.S.

For . . . TAPS
STEP CUTTERS
BORING TOOLS
PROFILE MILLS
CENTER DRILLS
ETC.
Inter-changeable cams and index plates for 1 to 14 flutes.
Inter-changeable collets up to 1.125" D.
Preloaded ball bearing spindle.
Easy-to-read settings. Easy to set up.
Base swivels for angular grinding.
Mounts on most grinder tables.
What'a relief!
More Cuts Per Grind
Better — Freer Cutting
Reduce perishable tool costs with this preferred grind on your straight and spiral flute production cutters — Easy and fast as ordinary angular relief grinding.
D·S GRINDER DIVISION
ROYAL OAK TOOL & MACHINE CO.
621 E. Fourth St., Royal Oak, Mich.
D·S
RADIAL
RELIEF
GRINDER

Carbide Masonry Drill Sharpening Technique

Four steps to sharpening carbide tipped masonry drills have been outlined by the Carboloy Department of General Electric Company in Detroit.

The Department recommends using a silicon carbide wheel (C100-18V or C80-18V), for use in resharpening the drills and restoring the original 118° included angle. The drills should be sharpened when a 1/64" or more flat develops on the cutting edge. The steps:

1. Bring the drill against the side of the grinding wheel at a 20° angle as shown in Figure 1. This 20° angle should be maintained, or drill will not cut properly.

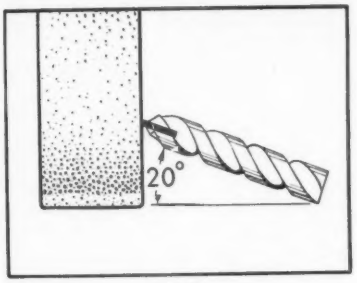


FIG. 1

2. Using moderate pressure, move the drill back and forth across the wheel to avoid overheating (Figure 2). (If overheating should occur, do not drop the drill into liquids to cool.)

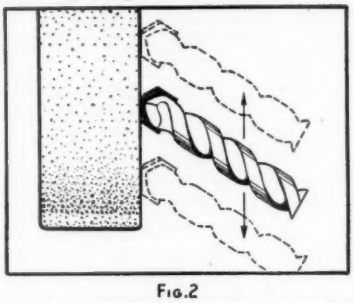


FIG. 2

3. Keep the two cutting edges of the drill of equal length while sharpening (Figure 3). If one edge varies in size, the drill will make oversized cuts.

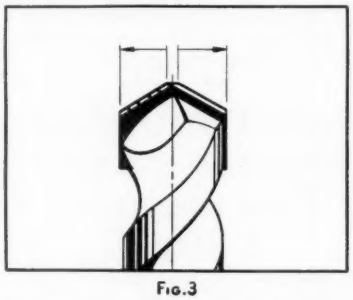


FIG. 3

4. Repeated resharpening of the drill will reduce the clearance between the carbide tip and the steel shank. When necessary, grind away the steel from behind the carbide tip so that the steel is nowhere closer than 1/32" to the working surface of the carbide blank. (Figure 4).

The Carboloy Department suggests that the drills can be sharpened on either a pedestal or bench type grinder. If the drill must be sharpened while on the job, a portable drill can be mounted on a stand and a small silicon carbide wheel used.

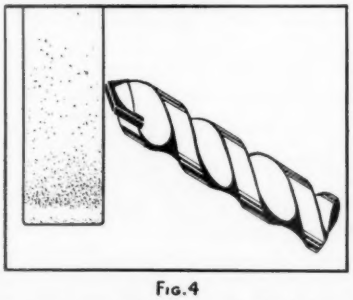


FIG. 4

MODEL J
10" x 18" Capacity

Check its

✓ CAPACITY
✓ STRENGTH
✓ 3-Point Suspension
✓ Safety
✓ Centralized CONTROL

and You'll buy a

JOHNSON BAND SAW

WRITE FOR DETAILS

JOHNSON MANUFACTURING CORP.
ALBION, MICHIGAN

Drilling and Reaming Diesel Locomotive Cylinder Heads

A new special machine for drilling and reaming Diesel locomotive cylinder heads has been developed which finishes the cylinder blocks at the rate of 50 per hour at 100% efficiency.

The machine has seven stations—No. 1 for loading and unloading; No. 2 for drilling 13 holes; No. 3 for drilling 11 holes and spotfacing one hole; No. 4 for drilling 12 holes; No. 5 for drilling two holes, core drilling and chamfering three holes; No. 6 for reaming nine holes, chamfering six holes and forming two spherical seats; No. 7 for reaming nine holes, chamfering one hole and forming two spherical seats.

The machine utilizes a fluid motor driven index table. Other features include hydraulic feed and rapid traverse, hardened and ground ways, and automatic lubrication.

Construction is to Joint Industry Conference standards.

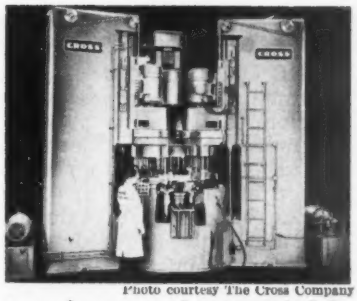


Photo courtesy The Cross Company

ISA Clinic Starts Soon

The Fifth Preconference of the Instrument Society of America's Instrument Maintenance Clinic is scheduled for Sept. 18, 19 and 20 in Chicago, Ill., three days prior to the opening of the Eighth National Instrument Conference Exhibit in the same city from Sept. 21 to 25.

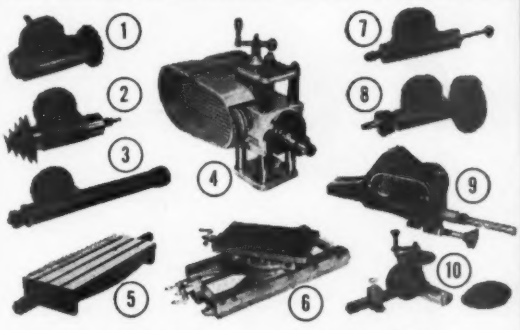
Among the many subjects that will be taken up at the clinic are pyrometers, electrical and electronic instruments, control valve selection and maintenance and combustion control.

The clinic, which starts at 1 p. m. Friday, Sept. 18, will be held in various classrooms set up in the Morrison Hotel. There will be a total of nine two-hour sessions, three each on Friday, Saturday and Sunday. Friday evening will be devoted to a general session on "Principles of Instrumentation and Automatic Control."

The Clinic is open to members of the Instrument Society of America and members of ASME, AIEE and IRF without charge. Non-members may attend, if space is available, and will be charged $3 registration fee which must accompany the application.

All those planning to attend the Clinic are urged to register now with the National Office of ISA, 1319 Allegheny Ave., Pittsburgh 33, Pa. Registration will close Sept. 14.

master
MACHINE TOOL ATTACHMENTS
for LATHES TURRETS MILLS
OR USE INDEPENDENTLY



1. 90° Universal Milling Head
2. Hi-Speed Milling and Drilling Head
3. Deep-Hole Internal Grinder Head
4. Basic Milling Unit
5. Milling and Grinding Table
6. Universal Feed Table
7. Internal Grinder Head
8. External Grinder Head
9. Slotting and Keyseating Head
10. Geared Dividing Head

THREE SIZES
MODEL "C," ⅓ hp — 9" to 13" LATHES
MODEL "B," ½ or ¾ hp — 13" to 18" LATHES
MODEL "M," 1 or 1½ hp — 18" to 72" LATHES

The Master attachment can be used profitably on many production operations. Mount it on your present equipment, lathes, turrets, mills, or use independently to perform additional operations in the same set-up. The basic milling unit with the above types of precision heads gives you facilities for milling, grinding, boring, drilling, indexing, slotting, and keyseating, internal and external. Its full complement of equipment is an outstanding value for maintenance, repair, tool room, and experimental shops, as well as production, thus performs a full range of shop operations at a minimum investment. These improved models are outstanding in rigidity, capacity, and simplicity of set-up and operation and incorporate the latest features developed in our 17 years of manufacturing this tool. Investigate this valuable shop tool. For the cost of one single-purpose machine, you can have several Master units producing. Prompt deliveries.

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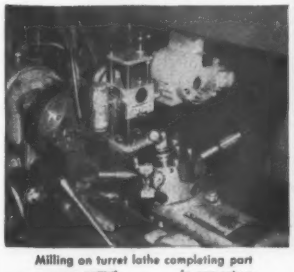
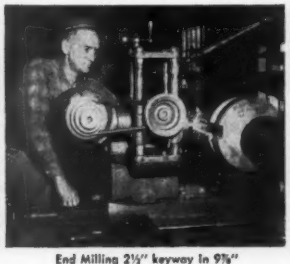

Milling on turret lathe completing part in one set-up


End Milling 2½" keyway in 9⅞" diameter shaft 22 ft. long

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GLASS CLOTH APPLICATIONS IN INDUSTRY

THE CHALLENGE of glass tracing and reproduction cloth is that of a provocative new product that leads to new ideas and to drastic simplification of production methods. It opens the door to valuable short cuts between the drafting room and production line that not only save time, materials, and floor space, but also assure greater accuracy of results.

The main uses of this cloth today are in the manufacture of templates for cutting out complicated sheet forms for form blocks, templates for large

by C. F. Ivins, Jr.
KEUFFEL & ESSER CO.
Hoboken, New Jersey

blanking and piercing dies, and check templates for complex forgings and structural members in wing and fuselage sections of aircraft. Lately, the automotive and railroad car body concerns have begun to use the material on similar applications.

Outside of these three big industries, glass tracing cloth has been scarcely used. The miscellaneous metalworking industries —where tooling, such as jigs, fixtures, and dies, is just as vital— represent the least developed field for glass tracing cloth, but one in which there is a large potential for reduction of costs and other benefits.

Stability of Glass Cloth

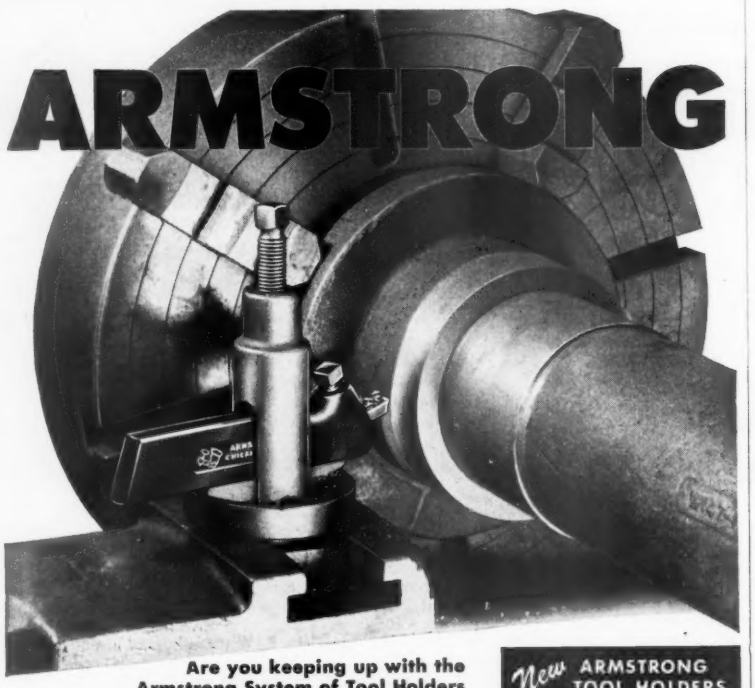
Because we are most familiar with one particular material, we will talk specifically about Stabilene*. This is a glass tracing cloth having high stability and transparency and made from glass fibers spun into yarn, woven into fabric, and specially impregnated with a synthetic thermosetting resin to give it body.

The outstanding and most important feature of Stabilene is its dimensional stability, its thermal coefficient of expansion being of the same order as aluminum. The latter is (1.33 to 1.59) x 10^{-5} per inch per degree Fahrenheit, while Stabilene is (1.0 to 1.5) x 10^{-5}. Such stability cannot be expected from paper or cloth. A companion characteristic of Stabilene is its resistance to change due to moisture. When subjected to 90% relative humidity for 48 hours, it showed a change of only 1.3 x 10^{-5} per inch per degree relative humidity.

Why all this emphasis on dimensional stability? When a true-to-scale drawing and reproductions of it are required, the original must be made on a medium which retains its size through all normal variations of temperature and humidity. Such variations occur not only in one plant but also in transit, possibly to distant parts of the country.

Transparency is undoubtedly the next most important feature of any tracing material. Starting with a glass fiber, which is naturally transparent, and going through the regular textile processes necessary to obtain a

Trade Mark Keuffel & Esser Co.



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WRITE FOR CATALOG

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tightly woven fabric, some transparency is lost. Much of this is regained by a special operation with the result being a transparency excelled only by clear film.

Tensile and tear strength are very high, although folding strength is poor because of a tendency of the glass fibers to fracture when the cloth is folded and creased. It is flexible, however, and single ply material can be rolled on a 1½" core.

Pencil and ink take, ink adherence, and erasability are also imparted to the base glass cloth by special coatings. Pencils from 4H to 8H are recommended, depending on the weight of line desired and the individual draftsman's touch. For ink lines, ruling pens with carbide tips are recommended because of the cloth's hardness. Regular quill pens or Leroy* pens are suitable for lettering. For all ink work, it is advisable to first pounce the surface and wipe thoroughly clean with a rag, or to use a very light solvent such as benzene or carbon tetrachloride, to remove any dirt and grease deposited from the draftsman's hands or from the air. Waterproof acetate drafting ink is recommended. Ink lines can be drawn to as fine as one or two thousandths with the proper care.

Stabilene glass cloth is designed to withstand severe erasures of ink lines in the same spot and still take another ink line without feathering. Care must be exercised when using a mechanical eraser. We recommend starting with a harsh eraser, finishing off with a soft rubber one.

For original work, Stabilene glass cloth can also be obtained with a special pigment coating for scribing purposes where lines finer and more uniform than pencil or ink are desired. This is creating a tremendous amount of interest and is being rapidly adopted on many applications where precision is critical. A special Carboloy carbide-tipped scriber has been designed for the scribe coat. Connections can be made by painting over the scribed areas with a special "touch-up" lacquer.

*Reg. U. S. Pat. Off.

Reproduction Cloths

Possibly of equal importance to glass tracing cloths are the glass reproduction cloths. By sensitizing regular glass cloth with light-sensitive solutions and emulsions, accurate originals on Stabilene can be readily reproduced and still retain the dimensional stability required.

The coatings available on glass cloth are brownprint, dry diazo, and moist diazo type sensitizers for exposure under high intensity light; and, also, several silver salts emulsions for contact, reflex, and projection type work.

The original drawn to accurate size on glass cloth can also be faithfully reproduced on metal and some non-metallic surfaces by contact printing. This eliminates costly and time consuming scribing, or expensive and complicated camera installations. The steel, aluminum, magnesium, or even plywood or masonite is coated with a sensitizing solution—either of the negative type, such as blueprint

. . . *Continued on page 118*

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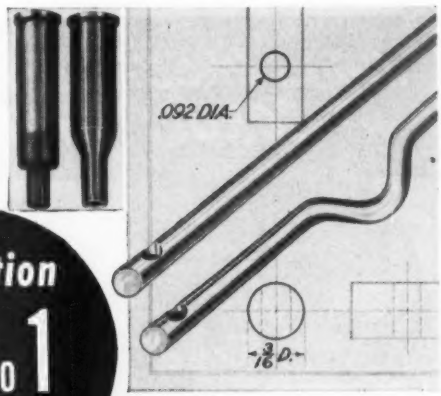

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Mr. Gerard J. Mauro, President of Gemco Manufacturing Company, Metal Stampings and Wire Forms, says: "We are perforating C.R.S. Basic wire, 3/16 diameter, with straightground whipsleeved Pivot Punches of .092 point diameter. Although this exceeds a 2-to-1 ratio we are getting runs of 35,000. Our own punches achieved runs of only 400 to 500."

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NORTH TONAWANDA N Y

. . . Electronic, from page 62

It was apparent that a data-handling system must serve two functions: (a) To translate the schedule generated by this master computer into specific shop instructions, and (b) to measure and feed back the actual rate of progress, as initial conditions for the next scheduling computation. A data system to perform these functions appears feasible, even though the design of the master scheduling computer may not be yet. Furthermore, a data system might well pay for itself in a short time by means of the saving in clerical salaries, and thus pave the way for introduction of the master scheduling computer at a later time.

To investigate this application of electronic machines to production-data processing, a two-phase study was planned. The first phase was to consist of a number of plant visits to companies in the Los Angeles area, to determine some of the characteristics of those firms which might be interested in electronic data systems — number of employees, type of product, type of production organization, and so on. The second phase was to locate one firm in the local area that met many of these requirements and study it in detail, with the aim of designing an electronic system to meet their needs.

Based on results of the first phase of the study, we will first split the field of production control into two main segments.

One main segment of the production field about which much has been written recently (is characterized by the emphasis on) "automation"—automatic materials handling and automatic control of the continuous production line. The continuous line appears to be the objective of much of American industry, in order to achieve mass production and low unit cost. The use of electronics here would be that of control, to replace some production employees in the routine operations of meter-watching, switch-throwing, and so on. This is an important field and is receiving considerable attention today, not only by industrial engineers, but also by electronic and servo system engineers.

In a continuous line plant, a relatively large production-control staff is usually not needed. The main production problem is estimating the size of the market (rate of demand) and then adjusting the rate of production to meet this demand. The small number of clerical employees in the production-control office does not hold much hope for necessary cost savings in such firms. (W. N. N., Tech. Ed.—Few plants have reached this stage, where the many components of a finished product are each manufactured on a continuous production basis).

Rather, it is the other segment of the production field with which we will be concerned — the job shop operation, where a large variety of products is possible, and production is to customer order rather than to finished goods inventory. These firms have a relatively large production control department. The results of the first phase of the study can be stated briefly. It appeared that job shop plants with less than 500 employees probably could not justify the purchase of an electronic production control system; also, plants with over 1000 employees could well consider the purchase of such a system. Firms with

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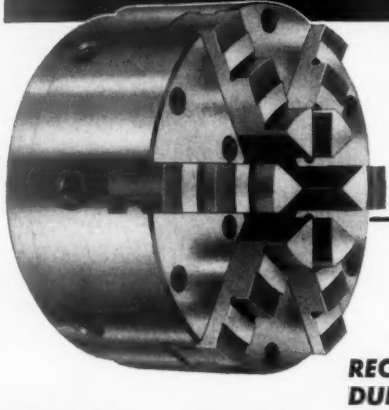

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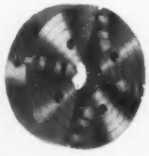

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over 500 but less than 1000 employees varied in their need, and would require individual detailed analysis.

The foreman in a continuous line plant has little freedom of choice as to which job will be worked on next. At the other extreme, in the large job shop, there are any number of jobs waiting to be worked on in any department, and (it is not unusual for) the foreman to be faced with the task of choosing which sequence to work on them. Other forms of this "freedom of choice" problem were encountered, including plants with a large volume of engineering changes, a complicated payroll structure where any one employee might work on as many as 10 different wage rates during a week, and large volume inventory control where it is difficult to pick up the individual disbursements easily.

In the course of these plant visits, one plant stood out above the others as an interesting one for a detailed study. The production control manager had developed quite an efficient manual system of production control, by the use of centralized inventory control, a priority system based on due dates, control boards in each department showing the due dates of the jobs in that department, and so on. With about 1000 employees in the plant, there were only eight expeditors (or about 0.8% of total employees, which compares very well with the 2 to 5% figure reported in other plants). It was felt that if an electronic system could "compete" with their present manual system, this would bode well for the use of electronics in other plants. The company produces on a job shop basis—to customer order, rather than to finished goods inventory. A large variety of products is possible, and individual customer specifications are common.

Processing (of customer orders) calls for a fair amount of clerical effort—exploding bills of material, posting requirements, recapping requirements and comparing with inventory, deciding whether to enter an order (shop or purchase) to obtain the parts, preparing such an order, investigating the status of raw materials and ordering same if needed. Assume that several thousand such orders are in the plant or in the purchasing department at any one time, and that some of these are behind schedule, due to machine breakdown, tooling troubles, reworks, and so on. Finally, let us concentrate on the production controller, or chief expediter, whose responsibility it is to coordinate activities so as to get all of the parts of one customer order into the assembly department at one time.

There are too many orders in the shop for him to remember the status of all of them. So, decentralization is used; expediters are assigned to groups of departments to watch the status of orders within those departments. One of the main functions of these expediters is to observe the "exceptions" — orders behind schedule—and take corrective action or report the matter to the chief expediter. The other important source of such "exception" data is the assembly department, which informs the chief expediter that certain assemblies cannot be worked since they have parts missing.

Since there is no regular flow of work within the shop, it is next to impossible to predict

. . . *Continued on page 120*

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. . . Glass Cloth, from page 115

or brownprint, or of the direct positive line type, using dry or moist developing diazo dyes. The sensitizer can be readily applied to cleaned and etched metal stock by spray gun, roller coating devices, or simply by brushing. Developing solutions also can be applied, thereby reproducing the exact original on the working stock.

Application Procedure

The major use of glass cloth today is in the aircraft industry. When it was introduced to this field in 1943, its simplicity and many advantages in tooling production were quickly revealed.

Up to that time, hand scribing the contours and shapes directly on template stock was a common practice, using dimensional engineering drawings as the guide. Two steps were necessary—first, the original dimensional drawing, and next the lofting on the template stock. This was extremely time consuming and there was always a slight difference in each multiple piece depending on the individual loftsman doing the job. There were means of reproducing images on metal templates—by photographic projection, by reflexing from the scribed metal master through an emulsion-coated glass negative, and by a special X-ray system. Due to the initial cost of the equipment and the complex nature of these processes, few plants employed them. Also, these methods presented the problem of handling and storing assorted sizes and shapes of heavy glass plates.

All this was changed with the advent of glass tracing cloth. It is now a simple matter to reproduce on metal stock a master accurately drawn to full scale on Stabilene glass tracing cloth.

Let us follow through the various steps for making a metal template. The same general procedure is used in marking tool stock for machining.

In the drafting room, a full-scale master drawing with all details and tooling information is made on glass tracing cloth, either with pencil or with ink. The usual ½ or ¼ scale drawing is entirely eliminated.

If a company is accustomed to scribing on metal plates and desires a line of extreme fineness and uniformity, Stabilene scribe coat can be used.

If there are subcontractors or subassembly plants involved, duplicate originals of the drawings are made on sensitized glass cloth from the master.

In the reproduction department, the master drawing on glass cloth—or a duplicate original—is exposed in contact with a sheet of sensitized tool or template stock in a vacuum frame, contact print box, or similar equipment for ensuring close contact. The tool or template stock is then developed in accordance with the type of sensitizer used. This work can be done in the open under fluorescent or incandescent light. Direct sunlight, however, must be shaded. If silver salts emulsions are employed, however, a semi-dark room will be necessary.

Before application of the sensitizer, the metal must be thoroughly cleaned of any grease or dirt in order to effect good adherence. This degreasing is done with carbon tetrachloride or some commercial cleaning sol-

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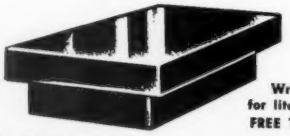

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vent. For steel, this is followed by a hot 6% chromic acid dip for approximately two minutes to give a mat surface. For aluminum, a 5% sodium hydroxide quick dip provides the proper surface. For Masonite, only the degreasing is necessary.

With steel stock, a white base lacquer is advisable as a precoat to obviate any possible chemical action of iron on the sensitizer. Another reason for the precoat is that degreased and etched steel has a dull surface which does not give the high contrast desired of the image against the background. Aluminum, however, when etched gives a bright surface and there is little need to precoat the metal. The precoat can be applied satisfactorily by spraying, and the plates air-dried in about ½ hour. If a circulating hot oven of about 150° is used, this can be speeded up to four or five minutes.

Although there is quite a choice of sensitizers, one widely used is the Onyx 3053, a diazo material with a liquid developer. This particular sensitizer has several components that are mixed just prior to using. It is spread onto the metal with a spray gun of stainless steel and having a fan type nozzle. A uniform coating is desirable, since any heavy areas will require longer exposure. The sensitized plate will air-dry in about 15 minutes, but may be speeded up in a simple heat cabinet.

In printing, two things are required: (1) a light source, and (2) adequate vacuum or pressure to obtain a tight contact between the glass cloth master and the sensitized metal stock. Several types of vacuum printing boxes with built-in light sources are commercially available. A horizontal frame is preferable to a vertical frame for this work because of the weight of the metal sheets. Where thick tool stock is used, and the glass of the vacuum box cannot carry the weight, plate glass will provide the contact of the glass cloth on the tool stock and several photo-flood bulbs can serve as the light source. This method is feasible for small tool and die shops and many small, miscellaneous applications.

After exposure in the above manner, the metal stock is returned to the spray booth and a developer sprayed on to bring out the image.

The tool or template material with its image lines is then ready for the shop. It can be drilled, sawed, milled, shaped, and ground according to the requirements.

Advantages

One manufacturer in the aircraft industry has listed the following advantages offered by this process:

1. Permits unlimited number of accurate reproductions of either "as shown" or "opposite" parts from the same layout.
2. Facilitates standardization of layout practice and procedure resulting in uniform arrangement and terminology of layout information. Shop men work more efficiently from standardized tool layouts.
3. All the information necessary to fabricate tool is included

. . . *Continued on page 122*

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. . . Electronic, from page 117

how many shop orders will arrive in any given department during a day. Thus bottlenecks can and do develop overnight. When bottlenecks do occur, the decision must be made whether to authorize overtime or send some of the jobs outside on a subcontract basis. The former course has its obvious drawbacks, while the latter course costs heavily in time, in order for bids to be requested, and received, tools and materials shipped to the outside firm, etc.

What does electronics have to offer for such a picture, as far as the mechanization of clerical functions is concerned? Figure 1 is a flow diagram of the proposed method of processing customer orders at the specific company studied. The first operation is that of typing a standard sales order from the customer's order. Such items as inspection procedure, renegotiation clause, customer code number, and product code must often be added to the information supplied by the customer. By using an electric typewriter such as the Flexowriter, a punched paper tape is obtained in addition to the regular typed document. This punched paper tape has the information in a form suitable for direct entry into an electronic data-handling machine (EDHM).

Bills of material are prepunched into punched cards (which are still important "building blocks" in a systems design, even with the advent of magnetic tapes, etc.). The appropriate decks are selected by the operator and fed into the machine. The machine combines this variable data (quantities, due dates, etc.) with the standard data and posts these on the requirements magnetic tape. After all postings are made, the machine scans the requirements for each part number, and compares it with the inventory data for the same part on the adjacent tape. Parts that **may** need ordering can be used for a "loading" computation, or the decision on what and how much to order can be made by the human operator after the machine prints out the facts. In addition to storing the order information, the machine prepares the customary papers.

What has the machine done so far? Nothing that is not done already by manual methods, except that the operations of writing, computing, sorting, selecting, and so on are done by machine instead of by clerks. As an important by-product, we have the pertinent information stored in the machine, where it can be used for other purposes. In much this same way, information on the progress of shop orders within the shop can be picked up and stored in the machine. A detailed discussion of how this is accomplished may be obtained.

Now, what does the production controller do with an electronic system? Figure 2 is the block diagram of the analysis part of the system.

A tub file of punched cards provides one card for each customer order for one month. These cards are sorted and collated by shipment due dates. As a first step in the analysis, the production controller selects the cards from the front of the deck; these cards represent shipments that are past due, due this week, and due during the next two weeks or so. These are read into the electronic data handling machine (EDHM).

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For each card, the machine then automatically refers to a magnetic tape memory showing how many parts are short for each assembly order. The information is presented graphically so that the production controller's attention is directed, for example, to those assembly orders that are past due and have parts missing. He next asks the machine to indicate the part numbers of these critical parts.

The next step is to find the present status of all shop orders that are making these critical parts. To do this, the machine automatically refers to another magnetic tape memory (at least four such tape units are tied to the machine, each storing the equivalent of 12,000 punched cards). Now, the production controller is able to concentrate on the critical shop orders.

Notice the difference between the present manual systems and the electronic systems. In the manual systems, no one man can keep track of the status of all orders in the shop, so that this function is split up between a number of men. In the electronic system, the machine has all the information available and presents the desired information on demand to the production controller, for his decision. Except for this, however, the electronic system is still not too different from the present manual methods.

Why have we mixed punched cards with magnetic tapes? Why not all one or the other? Punched cards are still very useful for the operations of printing, sorting, and collating data. Also, they are an economical and efficient form of data storage where sequential access from small decks of cards is sufficient and where few changes occur in the data; it is hard to "erase" a hole in a card for example. Magnetic tapes, on the other hand, have the advantage of automatic look-up (called random access), ease of erasing and changing the data, and no need for the machine operator to constantly feed in new decks of cards to the machine. It is likely that for some years to come, electronic data processing systems will make use of both methods.

Now let us consider the scheduling problem—the anticipation of bottlenecks and the decisions on the most effective corrective actions needed. Due to the limited memory span of the human mind, the number of variables that enter into these decisions must be reduced to the point where one person can comprehend them.

Simplification of the manual scheduling operation is accomplished as follows. The main criterion of priority for a shop order is its due date—first, the date on which it must be ready for assembly; and, second, the individual operation due dates that must be met in order to achieve the final due date. If parts are holding up the completion of an assembly, a higher priority can be given by setting back the individual operation due dates until there is no other job in the department with an earlier date. However, if the coordination of several shop orders is involved, to make them all arrive at assembly at the same time is often too complicated to solve very accurately mentally, due to all the inter-actions. The time estimate for a shop order to progress through several operations is not calculated from

. . . *Continued on page 136*

To Prove Their Valor Redskin Warriors Used Marking Devices

In the Frontier Days, Indian warriors used painted or decorative marking devices to indicate their prowess and to show how many or what kind of coups they had performed.

CADILLAC 115
HAND MARKING MACHINE

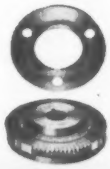
GENERAL PURPOSE FLOOR TYPE HAND MARKING MACHINE

Marks: Flat or Round Parts...Parts of Varying Thickness
Rolling Operation for Marking Requires Minimum Pressure

This machine is ideal for many light marking operations and short run jobs . . . its simple construction permits easy changes from one marking operation to another — thereby reducing down-time. Simple fixtures generally suffice for locating parts to be marked . . . specifications for fixtures can be readily met.

Dangers of distortion and fracture are minimized — pressures reduced to barest minimum because this machine *rolls* the impression into the part.

For full information write for Bulletin L-115



ROLL TYPE HOLDER
Depending on requirements, can be had for either solid or interchangeable type.

MARKING MACHINE AND PUNCH PRESS HOLDERS
For Interchangeable Type
Made of alloy tool steel, all are furnished with a replaceable platen—hardened and precision ground.

For full information, write for Bulletin SE-130

CADILLAC STAMP CO.
FACTORY and OFFICES
17303 RYAN ROAD • DETROIT 12, MICH.

. . . Glass Cloth, from page 119

on layout. Not necessary for toolmakers to refer to engineering drawing.

4. Provides permanent record for future reference which can be readily filed in regular cabinets.

5. Mating parts on assemblies fit accurately because tool layouts are coordinated with each other, thereby reducing assembly time and number of rejected parts.

6. Errors on engineering drawings are usually discovered on layout and corrected before tools are made.

7. Reduces tool fabrication time by as much as 50%.

8. Reduces time required for inspection of tools after fabrication.

9. Reduces number of tool reworks required due to shop errors.

10. Simplifies rework of tools as required by design changes since original layout can be revised in accordance with the change, thereby eliminating the necessity for making a complete new layout.

11. Reproductions may be made on glass cloth from original master layout and conveniently shipped to subcontractors for more accurate coordination of manufacture in widely scattered production programs.

12. Effects savings of 30% to 40% in over-all costs of producing tools.

General Applications

Industries that have much in common with the aircraft industry are currently showing the most interest in glass cloth. These industries are primarily those dealing with large sheet metal fabrications—the automotive, refrigeration, air conditioning, and body building.

Smaller metalworking plants and tooling concerns will also be able to use glass cloth effectively. Any shop that makes or uses check templates, drill templates, form blocks, router blocks, jigs, fixtures, and dies.

Intricate shapes and contours can be cut accurately from thick metal plates, by gas cutting machines that employ an electronic tracing device. The tracer follows the lines of an original drawing on glass tracing cloth, and by means of a pantograph arrangement, guides the gas torches.

For optical comparator methods of inspecting small precision parts, the master is drawn on the highly translucent glass tracing cloth which is fitted to the comparator. Another method is to scribe the original on Stabilene scribe coat, which in effect becomes a photographic negative. This is then reproduced on sensitized glass cloth to give fine black line details against the translucent background.

In the electronics industry, glass tracing cloth is being used for printed circuit work. Using any good waterproof ink with a wide-tipped pen, the desired pattern is drawn on the glass cloth, usually this is two to four times the final size of the actual circuit. The original drawing is reduced photographically to provide a glass cloth negative print.

Copper foil on bakelite or other firm insulating material is coated with a special engraver's emulsion. The image is trans-

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1728 Combinations
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Special and Stock-Sizes

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Precision, Commercial and Shoulder

DIECO Die Springs
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3 pressures:
Medium, Medium-High and High

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Industry acclaims DIECO **finer precision craftsmanship:** "DIECO Die Sets are smoother operating—no prybars." ". . . mount dies easier, quicker." ". . . longer die-life." ". . . less down-time saves manhours." ". . . better production, bigger profits."

Demand DIECO for socket head screws and **all** your tool, die and machine shop accessories. **Send for your DIECO Catalog, now.**

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PITTSBURGH 6: 122 S. Sheridan Ave. ★ EMerson 1-0440
DAYTON 4: The Die Supply Sales Co., 311 Vermont Ave. ★ MI. 9691 ★ TWX-DY-85
BUFFALO 1: Die Supply Corporation. 234 Carolina St. ★ MAdison 1964
ST. LOUIS 13: Scott Special Tools, Inc., 1252 N. Kingshighway ★ FOrest 3454

DIECO

ferred by contact printing to the metal foil. Acid is then used to etch away all copper except for the pattern image.

There are numerous other explored and unexplored fields of application for glass tracing cloth and glass reproduction cloth.

Shell Trimming and Beading or Forming Jobs Performed in One Operation

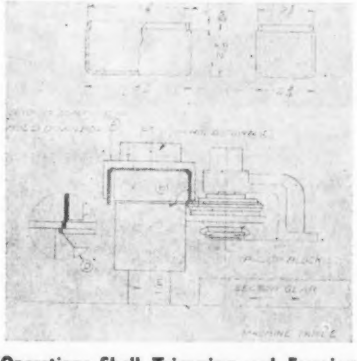
This is a case history covering a shell trimming and beading or forming job performed in one operation on the Dayton Rogers

Photos courtesy Dayton Rogers Manufacturing Co.

Shell Trimming Machine.

The part was a battery box made of 2S. aluminum, .034" thick, which was trimmed and a 1/16" offset formed around the top.

The hold-down box fixture



Operation: Shell Trimming and Forming on Battery Box
Material: 2S Aluminum .034
Approximate Production: 100-125 per hour
Tooling Time: 41.4 Hours

Next Month - 6th Annual QUALITY CONTROL Feature Issue

(A), was made to fit the outside dimensions of the oblong shell, and after the drawn shell was placed in the working position on the trimming and beading mandrel (B), the hold-down box was placed over the shell. With the hold-down (C) in working position, the external cutter and forming tool was engaged. The drawn shell, as shown at (D), was thus trimmed and beaded or formed in one cycle of the work spindle (E).

It should be remembered that there is a sliding or moving action between the hold-down box (A) and the hold-down spindle (C).

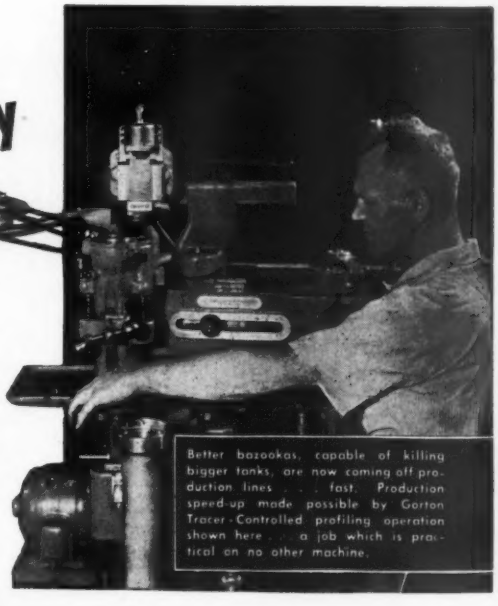
This type of work is very frequently required on drawn shells made of aluminum, steel, brass, and copper.

A lid is also drawn and trimmed to fit on top of this battery box.

Pantography at Work

★

Inside profiling operation produces more than 36 pieces per hour with Gorton Tracer Control. Approximate time by the next best method . . . one piece every two hours.



Better bazookas, capable of killing bigger tanks, are now coming off production lines . . . fast. Production speed-up made possible by Gorton Tracer-Controlled profiling operation shown here . . . a job which is practical on no other machine.

GORTON

• IMPROVES QUALITY
• INCREASES PRODUCTION • CUTS COSTS

On many all-but-impossible jobs, Gorton Tracer-Controlled Pantographs and Duplicators speed up production on military or industrial contracts. High surface finish results from spindle speeds up to 45,000 R.P.M. Accuracy results from the use of over-size masters, patterns, or templates together with the reduction ratio which is exclusively characteristic of the pantograph. Whether a dozen or a thousand pieces, each is identical to the first. Work piece size varies from instrument parts to areas of 10 to 20 feet.

Gorton tracer-controlled equipment quickly pays for itself in profiling, routing, die sinking, mold cutting, counterboring, chamfering, grooving, graduating, engraving as well as many other standard or special operations on ferrous or non-ferrous metals and plastics where work is flat, uniformly curved, cylindrical, spherical or irregular in shape.

Mail the coupon below for General Catalog illustrating the complete Gorton line.

PRODUCTION DATA—

JOB: Profile 6 locking lugs for male and female sections of new 3.5" Bazooka
MATERIAL: Aluminum alloy
CUTTER: 5/32" dia. single flute, fast spiral H.S. steel running at 3,900 R.P.M., without coolant
MASTER: 2 masters: one for male and one for female sections; 3 times oversize, traced manually
HOLDING FIXTURE: Pneumatic-operated internal expanding type
APPROX. TIME: 36 pieces per hour
ALTERNATE METHODS: None practical

GEORGE GORTON MACHINE CO.

1209 Racine St., Racine, Wis., U.S.A.

Please send at once complete information about the Gorton line contained in Bulletin 1655-1209

Firm .....
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Quality Control Service Offered

The Quality Control Corp. of New York has inaugurated a "Certified Thread Gage Inspection" service which is available to plants not having the facilities for checking such gages. The work is performed by highly skilled personnel working with the most modern equipment in air conditioned inspection quarters. The working temperature is held constant so that all the vital elements of fixed gages can be controlled to the highest degree of accuracy.

The facilities of this Certified Thread Gage Inspection are such that:

Thread plug gages are checked to determine the wear in the pitch diameter to .00005; the lead error to .0001; the angle to 2′ to 8′, depending on the pitch; major diameter to .0002; minor diameter to .0002 and thread form as to clearance.

Thread ring gages are checked to determine the angle to 5′ to 10′, depending on the pitch; lead error to .0001; minor diameter to .0002 and thread form as to clearance, fit on a master setting plug and if they are within tolerance of current government specifications, they are sealed.

An efficient indicator repair department is maintained for rebuilding all types of indicators and indicating gages, domestic and foreign. All indicators are disassembled and cleaned and worn and broken parts are replaced. Indicators, also, are carefully tested for accuracy with a special micrometer calibrating machine to determine the error in each graduation on the dial up to 2½ revolutions of the hand and to check the spring tension at the contact point.

For PRECISION at Surprisingly LOW COST

Put All Your MILLING, BORING and DRILLING Jobs on INDEX MILLS

Speed up operations with INDEX MACHINES as an aid in meeting today's high pressure tool room and production plant service. They assure you peak performance while holding to the Index reputation of precision and economy . . . For those heavy-duty jobs where increased speed and feed range are required, you will find your answer in this strong, rugged MODEL 55 VERTICAL MILL (Pictured). Capacity ⅛″ to 1½″ end mills in steel and a table working surface of 32″ x 9″ or 38″ x 9″, Overall 40″ x 9″ or 46″ x 9″.

MODEL 40 VERTICAL MILL
A machine that emphasizes the combination of Precision, Production, and Economy . . . It embodies many features that provide for faster, more economical milling, resulting in a substantial cut in production costs . . . It is sufficiently rugged for day-to-day operation and can also be used for accurate boring and locating . . . Capacity ⅛″ to 1″ end mills in tool steel. Table working surface 8″ x 26″, 8″ x 34″ overall.

MODEL 60 HORIZONTAL MILL
A versatile machine with simplicity of design that permits an unusually low price while reflecting quality, accuracy and practical utility . . . A product where advanced engineering and expert craftsmanship have joined to bring out an outstanding piece of equipment adapted to tool room use, yet sufficiently rigid for the requirements of production shops . . . Standard table 40″ x 9″ with larger table optional. Equals or exceeds a light No. 2 in capacity.

INDEX BUILDS BETTER MILLS . . . WRITE FOR LITERATURE

INDEX MACHINE CO.

541 N. MECHANIC STREET JACKSON, MICHIGAN

42,000-Pound Shear Cuts 1″ Mild Steel

An all steel shear that weighs 42,000 lbs. and operates at 30 strokes per minute has been developed to cut mild steel up to 1″ thick and 4′ long.

Mounted on a turn-table that is rotated by means of a circular rack and pinion, the shear can be set at different positions to eliminate excess handling of the large plates and coiled stock. It can be turned to 90° either side of center.

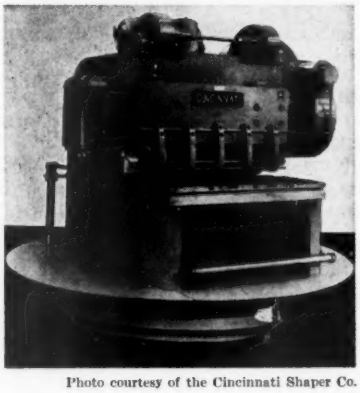


Photo courtesy of the Cincinnati Shaper Co.

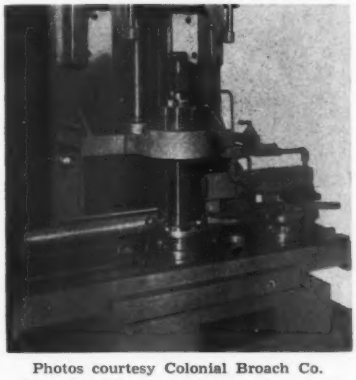
The shear is also equipped with a hinged gage angle that permits the cutting of plates longer than the back gage range.

Other features are a light beam shearing gage, ball transfers in the table and air counterbalances on the ram.

Broaching Intricate Internal Contours

An ingenious broaching setup recently developed, permits the use of standard broaching machines for broaching intricate internal contours of aircraft engine parts.

The six identical contours between the internal lobes on the part are broached in two passes, three alternate contours in the first pass, and the remaining three in the second pass. A two-station fixture is necessary to facilitate locating from the offset holes in the part. The part is shifted to the second fixture which is shuttled into broaching position for the second pass.



Photos courtesy Colonial Broach Co.

Fig. 1—Three alternate contours between lobes on the aircraft engine part is being broached on this single ram pull-down, with the part loaded in the fixture at the right ready for broaching the remaining three alternate contours.

Another interesting feature is the use of a built up type broach incorporating inserted broach sections. The machine is a standard 15-ton, 66-inch stroke pull-down single ram broaching machine. Multiple guide shoes guide the broach above and below the part. These shoes contacting grooves in the broach during vertical travel, insure high dimensional accuracy.

Twelve dowels in the fixture, six above and six below, engage six holes in the six lobes in the part. Complete support of the six lobes is thus provided while the part is being broached, holding the thin walled projections so as to effectively prevent any distortion during the operation.

The side shuttling fixture has a central opening through which the broach is returned after each pass. All movements of the shuttle are controlled and interlocked by limit switches, and operated hydraulically by the hydraulic system of the machine. The machine goes through one broaching cycle and returns automatically. It is then reactivated for the second pass to insure that the second fixture is loaded and in correct position for the next pass of the broach.

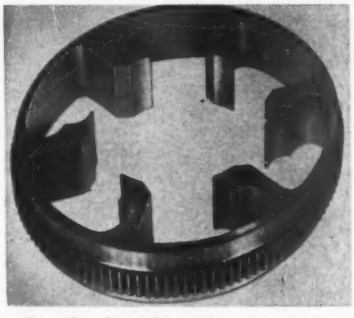
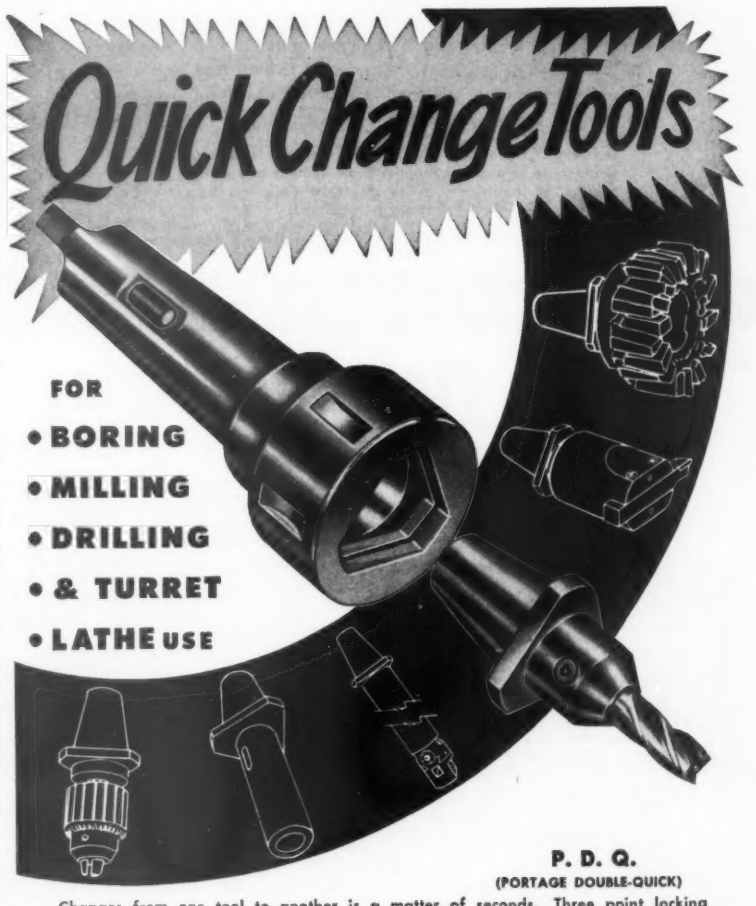


Fig. 2—Aircraft engine part has six contours between internal lobes broached in two passes on a pull-down broaching machine.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New Idea in "Stand-By" Air Compressor Service

A unique, nation-wide plan to save users of air compressors the high costs and operating losses resulting from sudden failure of their air compressor equipment is announced by a firm of specialists in this field.

Solving the prevailing problem of "how to resume operations without undue delay or big, on-the-spot investments in new air compressor equipment," the firm offers "stand-by" replacemen equipment, promptly installed on a short-term rental basis for the period required to repair or replace the original equipment.

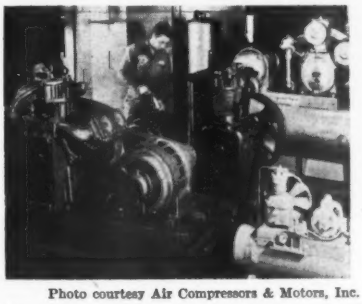


Photo courtesy Air Compressors & Motors, Inc.

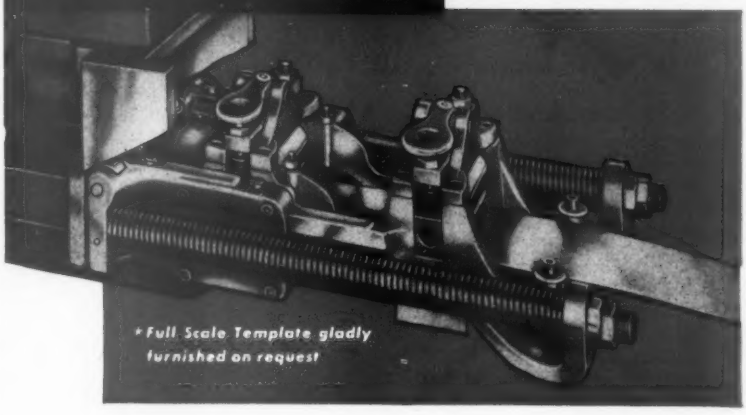
Many makes of air compressors are ready for "Stand-By" Service.

In order to meet any emergency anywhere, the company maintains one of the largest stocks of its kind in new and reconditioned air compressors of all makes and capacities to fit any type installation.

The firm's broad experience with all makes of air compressors, qualifies its engineering staff to provide unusually skilled and unbiased application service. Accurate fitting of the unit to the job, regardless of make, assures more efficient, trouble-free and economical air compressor performance

This new "Stand-By" service is offered in conjunction with the company's nation-wide sales and service in new and reconditioned air compressors, motors, accessories and parts.

No Jockeying with Dickerman Die Feeds



* Full Scale Template gladly furnished on request

Set-up men and press operators all know how critical starting a new coil can be into a complicated progressive die. Smash-ups at this point are costly both in down time and die repairs.

No need for both hands on the On and Off Control Buttons to "jockey" a new strip into position with Dickerman Die Feeds . On single trip or automatic operation, the feed advance is positive and accurate. Adjustments made for single trip operations when feeding a new coil or developing a new die, remain constant when the press is switched to automatic operation.

Experienced tool design and production men find this an invaluable feature of Dickerman Die Feeds in addition to their dependability and accuracy.

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Specify DESTACO FEELER STOCK

For precision fitting, checking clearances, inspection and production work. Available in 12" strips, ½" wide, in cellophane, packed 12 pieces of one thickness to a box; also in 25-foot coils 14 standard thicknesses from .0015" to .015".

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IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

You Need an Extra Hand Now to Speed Up Production!

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Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work now—save money too!

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JIFFY CABINETS WITH METAL OR PLASTIC DRAWERS

- **7 useful cabinet sizes**
- **Aluminum or see-thru plastic drawers**
- **Individual drawer guides**
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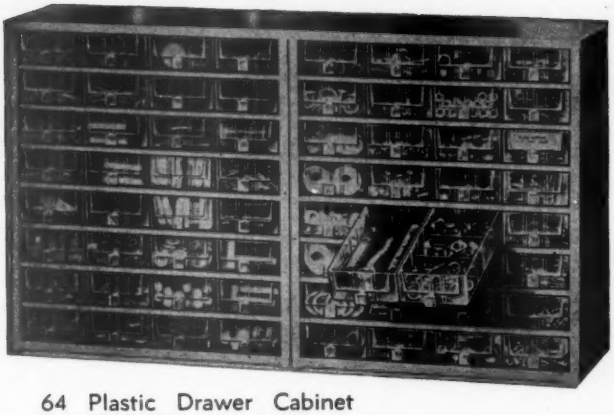
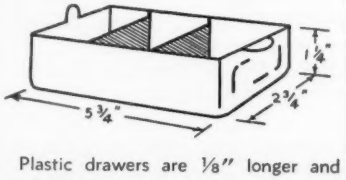
- **Safety catch on back of each drawer to prevent accidental spilling of contents**



64 Plastic Drawer Cabinet
(192 Compartments)

Index label and 2 removable drawer dividers for each drawer.



Plastic drawers are 1/8" longer and 3/16" deeper.

HANDIEST CABINET EVER BUILT FOR STORING SMALL ITEMS

No more frantic searching for misplaced items at home, shop, office or factory! EVERYBODY needs this convenient storage cabinet where small parts and supplies can be kept indexed, orderly, clean and easy-to-find. Your Jiffy Cabinet holds bolts, nuts, nails, screws, washers, drills, tools, repair parts, carbide tips, labels, radio parts, film . . . plus hundreds of other small, easily misplaced items! Attractive baked-on, silver-gray hammer-finish steel frame with rubber feet that won't mar any surface.

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METAL Drawer Cabinets	☐ 64 Drw. @$24.95*	☐ 48 Drw. @$19.95*	☐ 32 Drw. @$12.95*	☐ 24 Drw. @$9.95*	☐ 16 Drw. @$7.95*	☐ 12 Drw. @6.95*	☐ 8 Drw. @$4.95*

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AIR & HYDRAULICS

In presenting this booklet, the Logansport Machine Co., Inc., Logansport, Ind., has endeavored to bring to the readers a down-to-earth explanation of representative types of fluid power circuits. The popular circular shows the many possibilities afforded by the use of circuits. Some of the basic circuits and their ramifications are covered. Included in the booklet are such subjects as how cylinder speeds are regulated by control valves, the sequence operation of air cylinders and how the dual pressure air circuit can be used for chucking. **Circle No. C1.**

Arc Weld Surfacing. Lincoln Electric Company's Bulletin No. 466 is rich in examples and know-how concerning the techniques of building up a layer of metal on a metal surface by electric arc welding. Service conditions, size and shape of workpieces, finishing and many other factors are covered in a point-by-point discussion.

Also included is a "Hardsurfacing Guide," which gives a comparison between types of hardsurfacing material to help the user choose the material best suited for his particular type of service. Relative characteristics of hardsurfacing materials are listed. **Circle No. C2.**

Electroplated Gold is the title of a technical data sheet being offered by Technic, Inc., 39 Snow St., Providence 1, R. I. For the first time, Technic, Inc., reports, a concise summary of all available knowledge of the properties and characteristics of gold is presented. Also outlined is a notable modern application of research in scientific Gold Plating, originated and developed by Technic, Inc. **Circle No. C3.**

AIR TOOLS

This bulletin presents ideas for better maintenance and longer life for air tools and should be of value

to all users of them. Most everything concerning air tools, from lubrication to safety matters, is taken up. "Keep 'Em Cutting" is available from the Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 23, Ohio.

A section, also, is devoted to what to do when starting a new tool. **Circle Inform-A-Gram No. C4.**

PRECISION PIERCING

How Precision die-cut stampings are made in small lots is the subject of this informative brochure now being distributed by the Dayton Mfg. Co., Minneapolis 7, Minn. The know-how of this patented process is explained in detail with a number of examples. Four pages are devoted to basic piece-part stamping designs, with 20 or more piece parts. These piece-part designs can be used in the design and construction of conventional-type tooling. **Circle No. C5.**

"Applied Magnetics" is a bimonthly magazine containing material primarily designed to aid engineers and production men on problems concerning the design and development of permanent magnets. The booklet is published by the Indiana Steel Products Co., Valparaiso, Ind. **Circle Inform-A-Gram No. C6**

"Tool and Die or Maintenance Welding in the Forge Shop" is an extensively compiled 24-page manual outlining Eureka products to use and the procedures for application on drop hammer and hydraulic press forging dies, hot upsetter dies and punches, hot and cold trimmers and hammer rams and sow blocks. Booklet is available from Welding Equipment & Supply Co., 223 Leib St., Detroit 7, Mich. **Circle No. C7.**

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Basic tolerances for spline plug and ring gages having P.D.'s up to 8 inches, are shown on this handy slide chart. It is especially helpful to those designing or inspecting spline gages and is available from Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich. Explanatory notes concerning tooth thickness, parallelism, concentricity and major and minor diameter tolerances are located on the back of the inner piece. Other information and charts are on the back of the case. **Circle No. C8.**

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14	31	67	83A	96B	113	127C	141B	146C	153C	156E	161	166C	173C	179B	
15	32	68	83B	97	114	128	141C	146D	153D	156F	162A	167A	174A	179C	
16	33	69	84A	98	115	130	142A	148A	153E	156G	162B	167B	174B	179D	
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A8	A21	A34	A47	B10	B23	B36	B49	B62	B75	D2	E13
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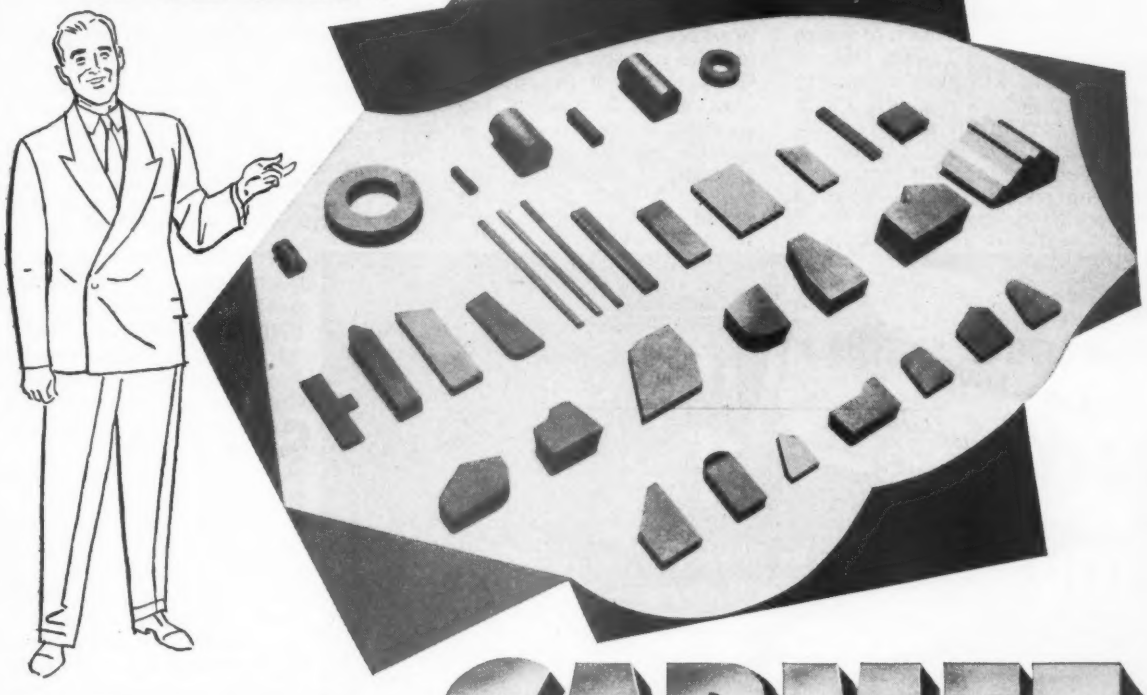

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SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

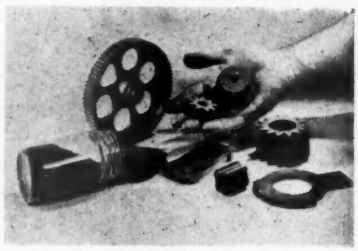
Powdered Iron

A new patented process for the production of powdered iron has been perfected by Republic Steel Corporation, the company recently announced. Republic will utilize the process for the commercial production of iron powder in a new plant, the erection of which will start soon in Toledo, Ohio.

The plant will have a capacity of 50,000 pounds per day, a substantial part of the nation's present market for iron powder. It has been designed for expansion to keep pace with the expected growth in the market.

In entering the much-discussed field of iron powder, Republic becomes the first of the nation's major steel companies to set up for its production on a commercial scale.

About 100 companies in the United States use iron powder to form gears and similar precision mechanical parts by pressing the powder between dies under high pressure and subsequently heating the pressed part to temperatures at which the particles of iron weld themselves together forming a unified mass with a smooth surface usable without subsequent machining. This permits such parts to be mass produced quickly and economically.



Precision mechanical parts such as these may be formed from iron powder produced by a new patented process of Republic Steel Corporation. The parts are formed by pressing the powder between dies under high pressure and then heating the pressed part to temperatures at which the particles of iron weld themselves together forming a unified mass. Republic will build a plant to produce 50,000 pounds per day of the powder.

Republic also proposes to make iron powder for application in the field of flame scarfing and cutting where substantial quantities are used to intensify the heat of flame; and for which Republic has use in its own steel plants.

Consideration is being given to the production, by a variation of the process of sponge iron which might be used to produce tool steel and similar high grade steels. Experiments also show promise of producing nickel and manganese from low grade ores.

Samples of the Republic powder have been submitted to seven of the largest consumers in the country and all reported the powder of excellent quality.

Republic will build the iron powder plant on land recently acquired, near the Toledo refinery of Sun Oil Company where facilities are being erected by Sun for producing high octane gasoline, to be completed in October. Hydrogen, necessary for the Republic process, will be a by-product of the process to be utilized by Sun; Republic will purchase such of this hydrogen as it requires.

Beside proximity to a source of hydrogen, the Toledo location is also well situated in relation to the automotive industry in Western Ohio and Southeastern Michigan. This industry has been, and probbably will continue to be, the largest consumer of iron powder.

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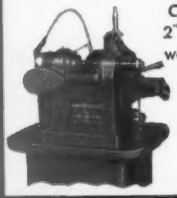
For the generation of spur gears and pinions only.

Capacity: 2" O.D. of workpiece.



HAMILTON No. 1

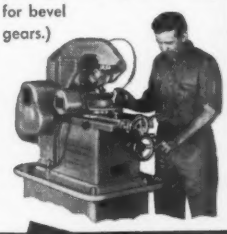
Hobs spur and spiral gears, worm gears and worms (to three thread), splined shafts, gear sectors, and pinions.

Capacity: 6" O.D. of workpiece.

HAMILTON No. 1-B

Generates any shape that can be made on the No. 00 or the No. 1 machines, *plus* bevel gears and face gears.

Capacity: 6" O.D. of workpiece (3" O.D. by 3/16" face, for bevel gears.)



Exclusive Greater range of hob spindle speeds: 109 to 1259 R.P.M. — 12 speeds.

Exclusive Speed, feed, indexing. *Each can be selected independently.* This, and wide range of hob speeds, adds flexibility; reduces set-up time; gives quick selection of speed and feed to suit material and gear size.

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Exclusive Generates gears from 3 teeth to 1200 teeth.

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THE Hamilton TOOL COMPANY

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Construction of the plant in Toledo is expected to be completed sometime in the summer of 1954. Because the process is largely automatic and continuous in operation, employment will probably not exceed 100 persons.

The Republic process utilizes iron ore both from Republic's Adirondack mining operations and also ore mined in Liberia, West Africa, by the Liberia Mining Company, in which Republic has a majority stock ownership.

The process resulted from knowledge gained in a continuing study by Republic of the direct reduction of iron ore to high purity iron.

"Direct reduction" is the term generally applied to processes by which iron or steel may be produced directly from iron ore. Conventional steelmaking utilizes a dual process—first, the smelting of the ore to a form of iron in a blast furnace, and second, converting this iron to steel. No direct reduction process economically practical for steelmaking in the United States has ever been developed. The tremendous initial cost of conventional blast furnace and steelmaking facilities has provided an incentive for continued research into reduction.

Republic started its investigations into direct reduction processes shortly after acquiring its iron mining properties in the Adirondack region of New York state in May, 1938. Although Adirondack ore is low in iron content, it can be beneficiated readily into a very fine quality ore with a high iron content and a low percentage of deleterious elements, ideal for direct reduction.

In 1948, and for several years thereafter, Republic joined forces with the Henry L. Crowley Company, Inc., of West Orange, New Jersey, in an intensified research program on the problems of producing iron from ore by direct reduction methods. The problem was approached by a radically different method than any previously attempted. The process was studied several years in the laboratory and a plant was constructed to prove out the process. Ultimately, it became possible to produce substantial amounts of a very pure iron powder day after day from either low grade or high grade ore.

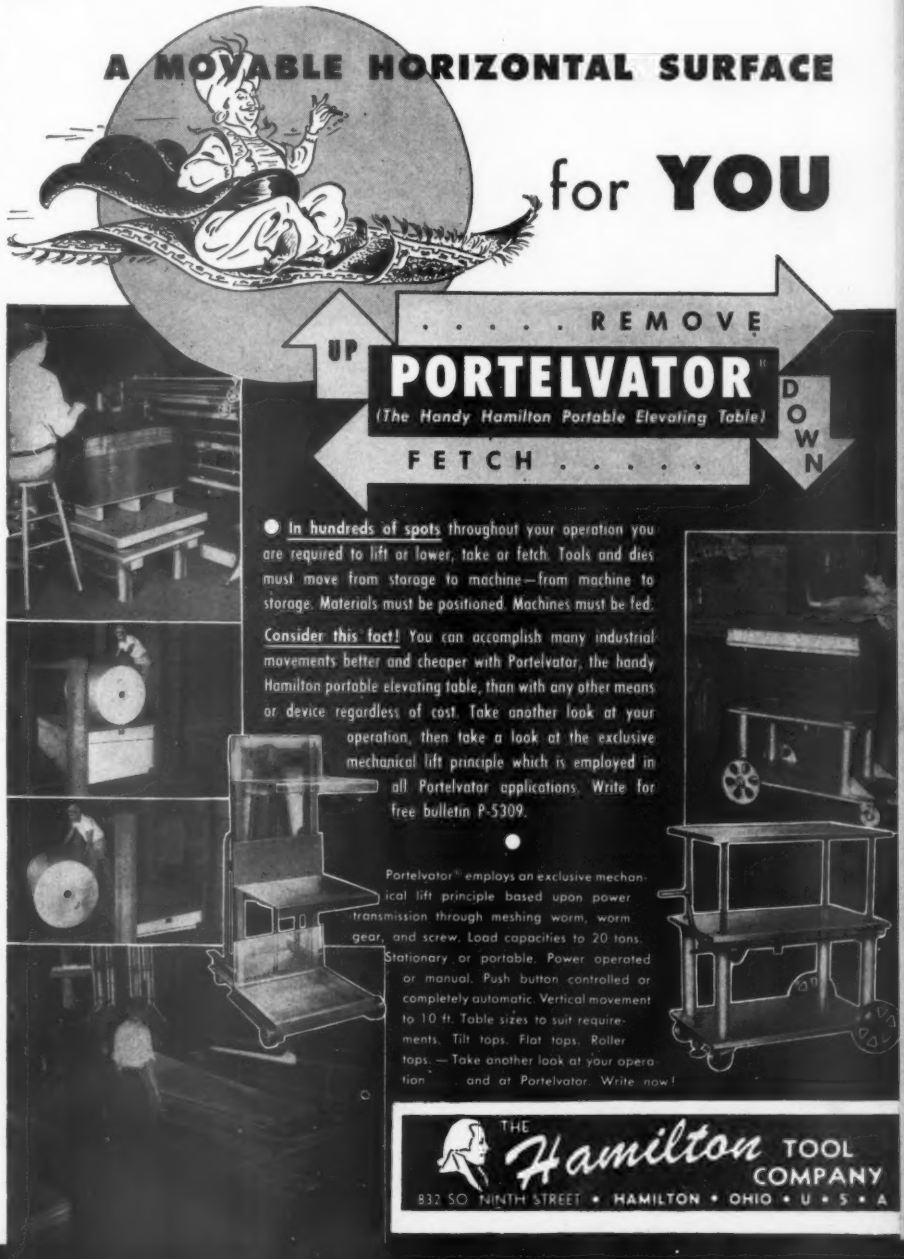
While the process proved workable, its economics, so far, are not competitive with conventional steel industry processes in a peace-time economy. However, from this research, new experience was gained. The result was the perfection of a process which is wholly owned by Republic and will be utilized in commercial production of iron powder at Republic's new Toledo plant.

Sheldon Machine Co. Buys Sabastian Firm

The Sebastian Lathe Division of Cincinnati Metalcrafts, Inc., has been sold to the Sheldon Machine Co. All Sebastian manufacturing operations now are being transferred to the Sheldon plant in Chicago, Ill.

An eminent manufacturer of precision lathes, Sheldon has stepped into the heavier geared head field with the purchase of the Sebastian lathe works.

Cincinnati Metalcraft now plans to devote its entire plant to producing industrial sheet metal products.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. . . Electronic, from page 121

standard times, but is likely to be an average "flow time" based on experience. Thus "rules of thumb" must be used, and expediters concentrate on the "exception" orders.

In such a situation, electronics begins to show a marked advantage over manual methods. Very little additional equipment is needed for this function, since all pertinent production data is already stored in the machine.

Referring again to Figure 2, we have added a block called the scheduling machine. For those familiar with industrial engineering, this machine is an electronic analog of the well-known Gantt chart. For those not familiar with Gantt charts, let us say that the scheduling machine assigns shop orders to machine tools in just the same decision-making manner as is done in the shop — only on a much faster time scale. The machine is then able to logically deduce what is most likely to be happening in the shop for each hour during the next few weeks.

The scheduling machine is first loaded from the shop order status tape. The machine then starts working its way into the future, hour by hour. When a machine tool is available, the scheduling machine scans through all waiting shop orders and picks the **one** with the highest priority that is slated to go on that type of machine. At any desired time, the machine can stop working into the future and total up the shop orders waiting in each department, to give a picture of scheduled versus available hours.

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QUALITY CONTROL
Feature Issue

When a future bottleneck becomes apparent, the production controller has several choices: change priorities to move some jobs faster, work overtime, send certain jobs outside well in advance, and so on. By "playing" with the schedule, he can derive a satisfactory schedule for the next week or two. Also, he can get a rough picture of the future by letting the machine run out a month or two in advance. A rough estimate of the time scale is 15 min. machine time for 40 hr. shop time.

Therefore, two statements can be made about the contribution of electronics to the scheduling problem. First, the electronic machine helps the production controller to include more of the important variables into his decision-making process, instead of using simplifications and "rules of thumb." Second, the scheduling machine allows the production controller to see the consequences of several alternative decisions, and to choose accordingly. We feel confident that a better utilization of productive facilities will be realized from such a system, with resultant savings even greater than those obtained from mechanization of clerical operations.

Of great interest is the magnitude of cost reductions that an electronic system might produce. Educated guesstimates are all that are available so far. At the company studied, it is estimated that the functions of about 14 of the 29 people now in production control could be handled by

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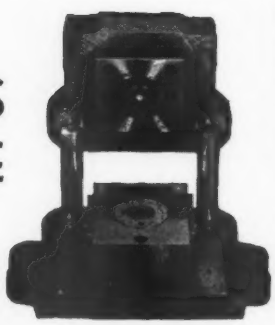

There's no need to make a complete new Die for any type washer or blank. The HOVIS UNIVERSAL WASHER DIES provide a Master Holder and by merely changing 5 SMALL, EASILY REMOVABLE PARTS the new washer or blank is produced . . . Special sets of parts are available for use in Master Washer Units enabling customers to produce irregularly shaped pieces and shallow draws. Multi-Washer Dies are also designed and manufactured.

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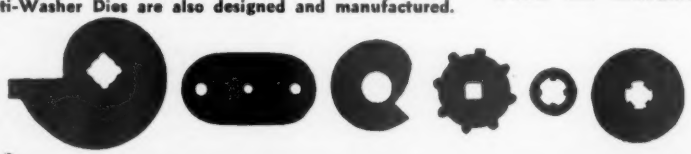

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the machine. This direct saving from salaries and overhead would amount to some $175,000 or more, in 2½ years. Since the company's product output in 2½ years would be in the neighborhood of $12,000,000, even a 3% increase in output from the reduction of bottlenecks and more optimum scheduling and loading would mean a saving of about $360,000. The two savings would total some $535,000 in 2½ years, whereas the cost of the equipment is estimated to be between $250,000 and $300,000.

References

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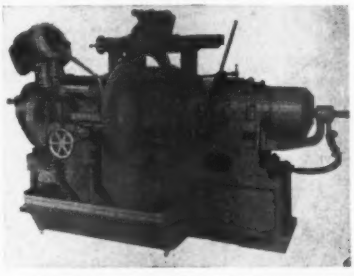
2. Salveson, M. E., "On a Quantitative Method in Production Planning and Scheduling," **Econometrica**, Vol. 20, No. 4, Oct. 1952.

3. Canning, R. G., "A Proposed Electronic Data Handling System for Production Control," Research Report No. 10, Feb. 1953, Industrial Logistics Research Project, University of California, Los Angeles, Calif.

Parallel Face Grinding

Highly accurate grinding at production rates is helping to hold down the cost of power steering for use in automobiles. Pump vanes, which are part of



Photos courtesy Besly-Wells Corporation

the power steering unit, are ground to within .0002″ in size and two sides are simultaneously

paralleled at 750 pieces an hour.

This operation is done automatically with a specially designed double spindle wet grinder. High speed tool steel vanes, which have been heat treated, are loaded into a hopper and automatically fed into apertures in a constantly rotating feed wheel. As the feed wheel revolves, the pump vanes are carried between the parallel faces of the abrasive disc where the two faces of the vanes are simultaneously ground. A total of .009″ of stock is removed in three passes. After grinding, the parts are automatically unloaded into a discharge pan.

The high accuracy obtained with this grinder is attributed to several factors. The spindles are equipped with super precision ball bearings. The heads are of quill construction which assures absolute control of abrasive infeed and avoids problems of distrotion and feed lag often encountered with dove tail ways.

This type of grinder can be easily adapted to grind other parallel surfaced parts.

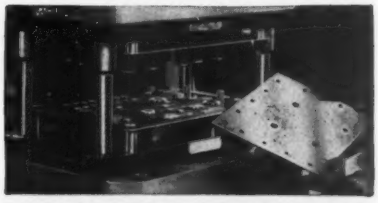
New • Fast • Proven

LOW COST methods for PERFORATING and NOTCHING SHEET METALS

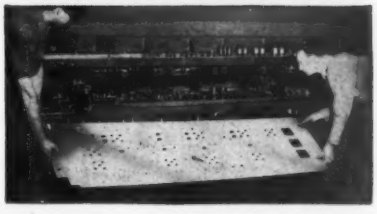
REDUCE DIE COSTS

All units and parts are interchangeable and used repeatedly in different arrangements. **INCREASE PRESS PRODUCTION**—*Down time is minutes as compared to hours for change-over.* For precision work in all types and sizes of presses. **START PRODUCTION AT ONCE.** Pierce materials up to ¼″ thick mild steel. Standard sizes and shapes available up to 3 inches. Special sizes to order.

Whistler *MAGNETIC* Dies at work in large inclinable press. Magnetized retainers hold the units. No bolting required. A fast, economical method in making up a punch and die set for short or long runs. All parts re-usable.



Whistler *ADJUSTABLE* Dies on perforating and notching job, using Tee slotted die set. With Whistler Adjustable Punch and Die units production starts within hours instead of weeks. Last minute job changes made quickly.



● Here are the complete details with prices and application illustrations. Send for these catalogs. No obligation.

NAME

FIRM

ADDRESS

CITY ZONE STATE

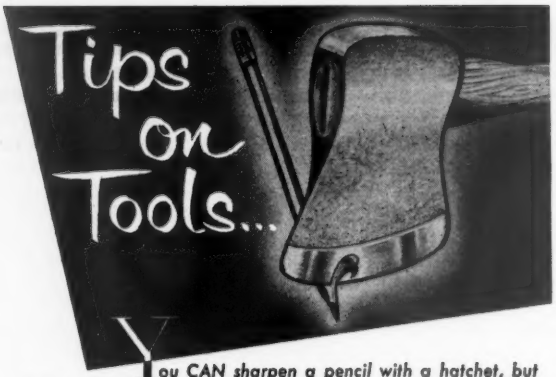
S. B. WHISTLER & SONS, Inc.

Adjustable, Magnetic, Custom and Cam Dies for all Industry

748 Military Road, Buffalo 23, N. Y.

For your convenience **Whistler direct factory representatives are located in most principal cities. Their on-the-job application experience, combined with Whistler's 35 years experience in the manufacture of tools and dies, is available on request.**

Visit us at Booth 2024 — National Metal Congress — Oct. 19 to 23 — Cleveland



You CAN sharpen a pencil with a hatchet, but a pencil sharpener is the best tool for the job. THERE IS ONE DIAMOND TOOL THAT IS BEST FOR YOUR JOB.

If there is room for improvement in your use of diamond in any form — wheels, tools, hones, powder, compound or loose stones, DTR, the diamond specialists are equipped to bring a profitable solution to your problem.

Our catalogs are free, our representatives at your disposal. Please write today.

WHEELS TOOLS COMPOUNDS POWDERS HONES LOOSE DIAMONDS

DTR DIAMOND TOOL RESEARCH CO., Inc.
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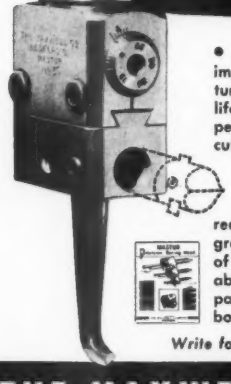
PRECISION BORING WITH MAXWELL MASTUR TOOLS



• Adjustable to 0.0002-inch, the new improved MASTUR boring tools feature precision, speed and long service life. New body and block construction permits these tools to take heavier cuts at higher speeds — to do more work in less time.

Adjusting-screw head is graduated into 50 divisions to provide readings in thousandths, and body is graduated to permit vernier readings of 0.0002-inch. The three models available have maximum boring bar capacities of 1/2, 3/4 and 1-inch and boring range from 3/8 to 15 inches.

Write for catalog. 987-MC

THE MAXWELL COMPANY
250 Broadway • Bedford, Ohio

CUT BLUEPRINTING COSTS 50% TO 80%

SAVE TIME—SAVE MONEY

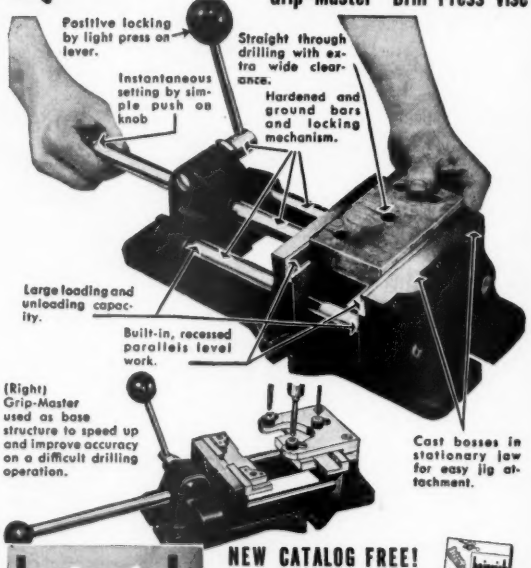
NEW, FASTER— MORE EFFICIENT!

• *Prints up to 14 ft. per min. Develops at 8 ft. per min.* Produces black line and colored line whiteprints in volume at low cost! Handles cut sheets or roll stock up to 42" wide in any length. *Equipped with 2000 watt* high pressure Vicor jacketed lamp for greater printing speed. *Newly devised blower system* for coolest contact—protects originals. Feed, delivery and all controls in front, within easy reach. Easy to install and operate. Trouble-free. Simple to clean. Minimum maintenance. 220 v. single-phase 60 cycle AC. Priced at $1565.00. *Get full facts now.*

Also other Versa-Liner and Spee-Dee Whiteprinting Outfits for Moist Diazo or Ammonia Dry Process from $55.00

PECK & HARVEY 5642 N. WESTERN AVE. CHICAGO 45, ILLINOIS
Founded in 1937—Over 10,000 Machines in Use
MFRS. OF WHITEPRINT, BLUEPRINT AND PHOTOCOPY EQUIPMENT

Speed-up OPERATIONS with heinrich "Grip-Master" Drill Press Vise


Positive locking by light press on lever.
Instantaneous setting by simple push on knob
Straight through drilling with extra wide clearance.
Hardened and ground bars and locking mechanism.
Large loading and unloading capacity.
Built-in, recessed parallels level work.
(Right) Grip-Master used as base structure to speed up and improve accuracy on a difficult drilling operation.
Cast bosses in stationary jaw for easy jig attachment.

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FORMERLY NATIONAL MACHINE TOOL CO.

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Be sure you have a complete Heinrich Tool Catalog in your files. Your copy will be sent free upon request.

DEPT. 133-J • RACINE, WIS.
Drill Press Vises • Fixture Locks • Nibblers
Punches • Rod Cutters

—Inform-A-Gram

QUICK-PIC CATALOGS

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DISC GRINDERS

This bulletin pertains to the Double Spindle Production Disc Grinder that was formerly made by Hanchett, but now is a product of the Mattison Machine Works. Details include specifications.

Circle Inform-A-Gram No. E1

CASTING MACHINE

The Lewis Welding and Engineering Corp. has this attractive catalog on its new 650-B die forge casting machine available. The firm's 200-ton "Hydra-Lock" hydraulic clamping machine is featured in the booklet.

Circle Inform-A-Gram No. E2

CAST PLATE & BAR

A new brochure on Reynolds Aluminum Cast Plate and Bar has just been released by the Reynolds Metals Co. It describes this new product which is now being made available for use in building tools, dies, jigs and fixtures.

Circle Inform-A-Gram No. E3

TAPE DISPENSER

Air Fixture, Inc., tells about its air operated pressure-sensitive tape dispenser in a recently published brochure. The booklet is well illustrated.

Circle Inform-A-Gram No. E4

VEE-TEX DRIVES

Just off the presses is this Qic-Pic catalog on Pyott Vee-Tex belts and sheaves. Selection tables and dimensional illustrations of various Pyott power transmission equipment are included.

Circle Inform-A-Gram No. E5

BROACHING MACHINES

The American Broach and Machine Co., has a new circular available that describes the firm's new line of heavy duty horizontal hydraulic broaching machines. Described are 15 to 60-ton capacity machines.

Circle Inform-A-Gram No. E6

INDEX TABLE

This issue of the Denison Engineering Co. house organ is a special index table feature. Case studies of typical Multipress index table production set-ups are illustrated and discussed.

Circle Inform-A-Gram No. E7

HONING TOOLS

Among the items discussed in a recent Barnes Drill Co. brochure are honing tools and other services for production finishing of cylindrical surfaces. Ask for Bulletin No. 500.

Circle Inform-A-Gram No. E8

THREAD GAGES

Prices and tolerances of Standard thread gages made by the Detroit Tap and Tool Co., are listed in a new 3-color, 20-page booklet (Bulletin SG-53). Other data of value to gage users included.

Circle Inform-A-Gram No. E9

TAPER-LOCK SPROCKETS

In this Qic-Pic Catalog, the man who selects, specifies or buys roller chain and sprockets will find all the data required. Each page includes cross-section drawings, dimensions and other information.

Circle Inform-A-Gram No. E10

VACUUM IMPREGNATION

This new F. J. Stokes publication describes in detail a wide range of application for Vacuum Impregnation. Among these uses are sealing metal castings against micro-porosity.

Circle Inform-A-Gram No. E11

INDUSTRIAL PUMPS

Tuthill presents its Model L line of mechanically-sealed pumps for handling non-corrosive liquids in Catalog No. 101. The pumps are designed to fill needs in lubricating and hydraulic operations.

Circle Inform-A-Gram No. E12

HYDRAULIC PRESSES

This catalog is presented by The Clifton Hydraulic Press Co. with the intention of assisting you in the correct selection of a hydraulic press to meet your exact individual requirements.

Circle Inform-A-Gram No. E13

NYLINED BEARINGS

The operating principles, advantages, design and application of Nylined Bearings are comprehensively described in this brochure put out by Thomson Industries, Inc. Also included are specifications.

Circle Inform-A-Gram No. E14

BONDING RESINS

The properties and instructions for use of Araldite Epoxy Resins are described in this Ciba catalog. Types, characteristics, uses and application of the material is discussed.

Circle Inform-A-Gram No. E15

COOLANT FILTERS

A new folder is now available on Delpark Coolant Filters for Gardner Grinders. The catalog contains data on late model Gardner machines and the Delpark Filters offered as optional equipment.

Circle Inform-A-Gram No. E16

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

Fast-Precision Tapping Made Easy!

Check These VIKING FEATURES

- Cuts tapping time 80%
- Takes jobs up to 18" in height
- Less breakage saves taps
- Needs only unskilled labor
- No vise necessary

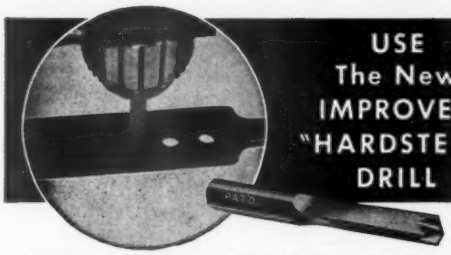
The NEW Improved VIKING Tapper

Fast precision tapping made easy with the new Viking Tapper, unskilled help can tap more holes in less time—and the work is more accurate and uniform. For example, a perfect ¾"—10 hole can be tapped in ¾" heavy tool steel in one minute. Saves taps too because there is far less breakage. In fact the saving on taps alone soon pays for the Viking Tapper.

Another important feature is extreme flexibility. Unique adjustable arm which can easily and quickly be raised or lowered, swung left or right, takes jobs up to 18" in height and requires less resetting. Sliding parallel bars hold work—no vise needed. Quick changing adapters take only 5 seconds to change taps.

Stand or bench model. Adapters available in eight sizes. Write for full information. THE VIKING TOOL AND MACHINE CORP., 6 Main Street, Belleville 9, N.J.

Drill Hardened Steels without Annealing—



With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon—high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

You Harden It—We'll Drill It—With "HARDSTEEL"

BLACK DRILL COMPANY, INC.
1368 East 222nd St. • Cleveland 17, Ohio

Also makers of— BLACK DRILLING UNITS—AUTOMATIC, SELF-CONTAINED—FOR COST-CUTTING PRODUCTION ON ALL MATERIALS *Write for information*

RAYMAC Solid Carbide DRILLS and REAMERS

RAYMAC drills cut hardened metal . . . do not burn or anneal. Feature operational speeds of 350 to 600 RPMs depending on size and hardness of metal.

RAYMAC solid carbide reamers are custom designed for individual jobs. Our engineering department is at your service to solve your reaming problems.

Write for catalog No. 12.

RAYMAC MANUFACTURING COMPANY INC.
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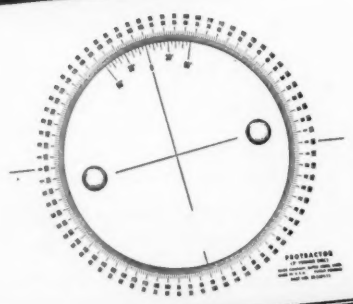
.125 PRECISION PLASTIC



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ANGULAR MEASUREMENTS

ACCURATELY TO 5' OF ARC WITH NEW

Optical Comparator Protractor

For any projector or comparator not equipped with screen rotation. No special staging or fixtures required . . . . sturdy, accurate and moderate in cost.

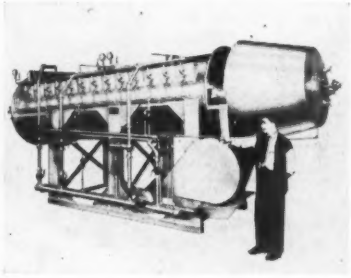
SEND FOR *Bulletin No. 53-850*

GAGE COMPANY
BATTLE CREEK, MICHIGAN

ALSO STOCKED BY GEORGE SCHERR COMPANY, INC., EXCLUSIVE REPRESENTATIVES, 200 LAFAYETTE ST., NEW YORK 12, N. Y. (AND REGIONAL OFFICES).

New Rotary Furnace Has Three Separate Temperature Zones

Three separate zones of temperature control is one of the features of the latest Rotary Retort furnace built by the American Gas Furnace Co. External controls enable the operator to regulate the temperature at will, in any one of the three zones



divided about equally over the length of the furnace.

Some reported advantages of the separate zone arrangement are an "ON" and "OFF" operation during idling periods and a very high input when producing work, plus readily controlled burners that allow temperature variation in each zone for special heating needs.

Complete details on other features and operating aspects of this new furnace will be furnished upon application to the American Gas Furnace Co., 586 Lafayette St., Elizabeth, N. J.

DURANT

INVESTIGATE THE DURANT LINE OF PRESS ROOM EQUIPMENT

INCREASE PRODUCTION! REDUCE COSTS!

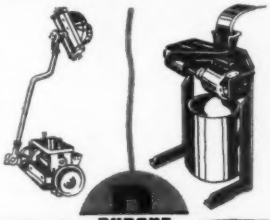
THE SELECT-O-MATIC ROLL FEED INDEXER

Replace your present roll feed clutch with this DURANT SELECT-O-MATIC multi pawl indexer that accurately controls close feeding due to its 6720 possible stations.

Write for complete information on our line of economically priced press room equipment

ROLL FEEDS

Choose from seven different models that take stock from 2" to 5" wide — Insures accurate feeding — Reversible — Simple to install.

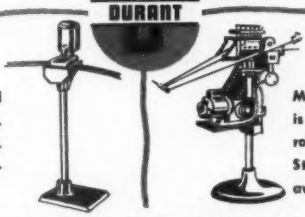


SCRAP CHOPPERS

Fits all power presses and has simple electrical plug in installation. Low first cost pays for itself — Pennies per day to operate.

STOCK OILERS

Prolong die life as they clean and lubricate stock in one operation. Variety of models are available. Eliminates hand oiling yet inexpensive.



STOCK STRAIGHTENERS

Motor driven equipment (shown) is perfect for thin materials. Top rolls are adjustable for thickness. Standard straighteners also available.

Inquire about our STOCK REELS, FOOT PRESSES, COIL CRADLES, WIRE STRAIGHTENERS, and PRESS FEEDS. Complete free catalog ready now. Write today.

DURANT TOOL SUPPLY CO. 135 ORANGE STREET, PROVIDENCE 3, R. I.

STOP DUSTS INSTANTLY

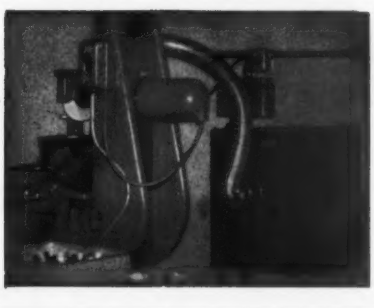
with

DUSTKOP

Available from stock of 22 standard models.

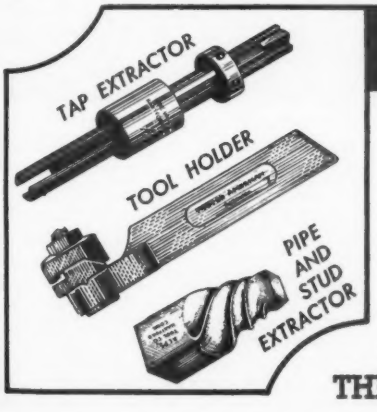
300 cfm to 10,000 cfm

Ask for Catalog 605-2. Describe dust problem for recommendation by return mail—No Obligations.



AGET-DETROIT CO.

213 Main St., Ann Arbor, Michigan



WALTON *SPECIALIZED* TOOLS CUT COSTS IN METAL WORKING

Consider your costs of time, labor, and lost production due to difficult removal of broken taps, screws, studs, and pipes. On many jobs these costs are the difference between profit and loss. Walton Specialized Tools will help you recover some of these losses. Likewise, tool changes can build up excessive costs. The Walton-American Tool Holder is a cost reducer. Its adjustable, swivel head may be set for straight, right offset, or left offset positions. Many holders in one immediately at hand at the machine. No lost motions.

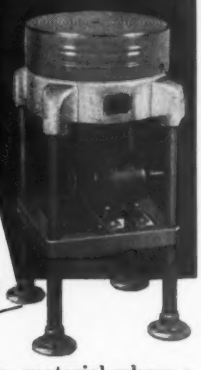
Write for the Walton Tools Catalog #38. It will tell you how to reduce your costs. Liberal free trial offer on all tools. Sold by leading industrial supply dealers.

SAVE TIME
SAVE LABOR
KEEP PRODUCTION MOVING

THE WALTON COMPANY, HARTFORD 10, CONN.

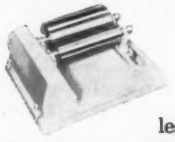
Precision LOW-COST LAPPING with Production Speed!

SPITFIRE FLAT LAPPING MACHINES



Designed for accurate lapping any material where a perfectly flat surface is important. Finishes to extremely close tolerances are produced.

The perfectly flat surfaces of sliding and rotating parts, air and liquid tight seals, plastic and die casting molds are quickly accomplished with this machine tool.



SPITFIRE ROLLER LAPPING MACHINES

For cylindrical lapping, giving an accurate, mirror-like finish in less time than any other method. Ideal for plug gauges. Saves as much as ⅔ in lapping time.

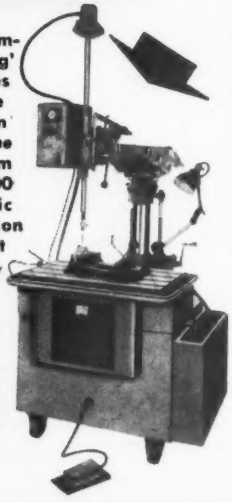
Write for Brochures, Prices and Delivery

SPITFIRE TOOL CO.

2935 N. Pulaski Road Chicago 41, Illinois

DRILL HOLES AS SMALL AS .030" IN ANY METAL OF ANY HARDNESS OR THICKNESS!

The M-300 Elox Electron Drill* combines the best in the 'arc machining' process. In addition to drilling holes as small as .030" it is adjustable for machine finishes ranging from *coarse, fine, extra fine and super fine* ...on any metals from magnesium to cemented carbide. The M-300 with exclusive Elox Automatic Feed allows for continuous operation with much of the human element removed. Using electrodes costing less than 3¢ per inch, with 'super fine' cutting, 1" of electrode will cut as much as 33" of hardened steel! Here indeed, is a dual-purpose machine that is being used for production machining of hardened steels and for removing broken drills in salvage. Write today for details and list of users.



ELOX CORPORATION OF MICHIGAN

740 N. ROCHESTER RD. • CLAWSON, MICHIGAN

RING PUNCHES

•

HARD... tough ... concentric ...

Precision-made of both Carbon Vanadium and high carbon, high chrome steels. Available in a wide range of stock sizes from 1/32" to 1" point diameters in increments of 1/64" for immediate delivery. Decimal sizes to order for delivery within 48 hrs.

Button Dies

Ring Type or Press Fit

Hole tapered to eliminate slug jamming. Sizes in stock to match punch sizes.

Write TODAY for your copy of handy data sheets covering specifications and prices; also name of distributor in your area.

Exclusive Distributor Wanted for the States of Washington and Texas

Ring Punch & Die Co.

108 FOOTE AVE., JAMESTOWN, N. Y.

solve heat-treat problems

with versatile Temco bench-type furnace

COUNTERBALANCED UPLIFTING DOOR... SWINGS UP, HOT SIDE AWAY FROM OPERATOR
4 EMBEDDED-TYPE ELEMENTS HEAT FAST AND EVENLY... EASILY REPLACEABLE
4½" FIREBRICK AND HIGH GRADE BACK-UP INSULATION
HEATING CHAMBER 5½" WIDE 4⅝" HIGH AND 9 OR 13½" DEEP
STRONG STEEL SHELL, ROUNDED CORNERS REINFORCED, WELDED CONSTRUCTION
1600 SERIES

Step up production, cut costs with Temco electric furnaces for heat treating dies, parts, tools, etc. Model illustrated above one of eight convenient sizes available with either electronic or manual temperature controls. Economical, easy to install and operate, low cost. Priced from $55.00 to $507.50. Write for literature and nearest dealer's name.

TEMCO® ELECTRIC FURNACES

THERMO ELECTRIC MFG. CO., 474 HUFF ST., DUBUQUE, IOWA

World's Largest One-Piece Surface Plate

The largest surface plate in the world so far as it is known, has just been made from granite in one piece by one of the leading granite surface plate companies. This giant surface plate weighs 60,000 pounds and measures 20 feet long, 6 feet wide and 3 feet thick. It is so big that 300 average size surface plates could be made from it.

The photograph shows Ivan Rahn, Factory Superintendent, checking the surface with an auto-collimator. This inspection showed that the overall accuracy of the entire surface is .0015″, every 6 foot square section is accurate to .0002″, and every 2 ft. sq. section is accurate to .00005″.

The surface is in the form of a quite uniform convex arc, as close to a theoretically perfect plane

Photo Courtesy Rahn Granite Surface Plate Co.

as man has yet attained in such large size. It is quite possible that any large object placed on this surface will conform to the uniform curvature, making possible measurements accurate to .00005″ over the entire plate.

Making the huge surface plate, to tolerances previously thought to be unattainable, required new engineering development and much special equipment in its production and inspection. The "know-how" and skill, acquired through ten years of granite surface plate research and production, were the prerequisites for this undertaking.

"We consider it an honor to have been selected to produce the world's largest and finest surface plate," says R. J. Rahn, Sales Manager, "It is a tribute to the skill of our craftsmen, so well demonstrated in the many thousands of Rahn Granite Surface Plates now being used.

Every Punch Press Operator Needs the "Safety" of a SAFEED Patented

PREVENTS INJURY — SAVES GLOVE COSTS

Feeds ferrous, non-ferrous strip or sheet . . . faster, safer. Use for stamping, shearing. Right or left hand non-slip fitted grip, self-adjusting. Sturdy, hardened work surfaces. FULLY GUARANTEED.

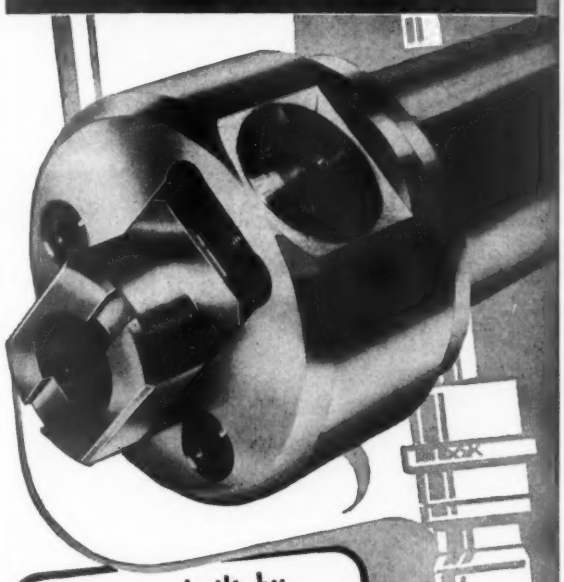
Write today
Early delivery.

DEPT. T6 AFFILIATED MACHINE & TOOL CO.
260 WEST ST., NEW YORK 13, N. Y. CAnal 6-4937

JOB PROVEN!

SAMSON

***offset* BORING CHUCKS**



precision built by precision toolmakers for accuracy and durability in service!

● Designed for quick tool change; equipped with new, extra large dial for precision radial adjustment; machined to provide positive dead centering for rigid, high production milling and boring without removal of chuck; available with a complete selection of interchangeable accessories—these are features that make the Samson Offset Boring Chuck the logical first-choice of the field.

Write for complete information today

ALSO Distributors of famous LAST WORD WHEEL DRESSERS

LAST WORD sales company

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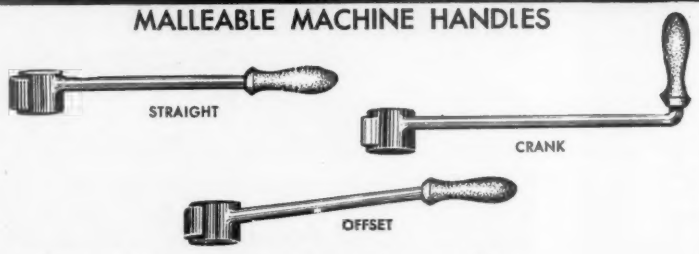
REID QUALITY TOOL-ROOM ACCESSORIES AT MODERATE PRICES!

MALLEABLE MACHINE HANDLES



Made in straight, crank and offset as shown. These are the finest and most complete on the market. Large variety of sizes. Designed to withstand severe usage. Well proportioned and neat in appearance. Finished, ready for use.

Also

The REID Line includes many other accessories and components, including plastic and steel ball handles, cast iron hand knobs, counterbalanced and solid web hand wheels, compression springs, etc.

FREE! NEW 44 PG. CATALOG

REID TOOL SUPPLY CO. Muskegon Heights, Mich.

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RIFFLERS

GROBET produces more RIFFLERS in more shapes and sizes than any company in the world.

Sold Through Leading Supply Houses.

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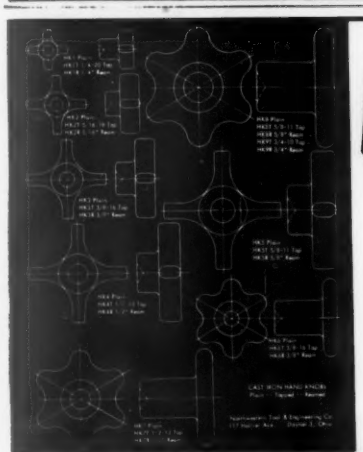
GROBET FILE CO. of AMERICA, Inc.
421 Canal Street
New York 13, N. Y



Free TRACING TEMPLATE COVERING 263 ITEMS IN FULL SCALE

QUARTER TURN SCREWS • SOCKET SHOULDER SCREWS • JIG FEET (three types) • FIXTURE KEYS (six sizes) • LATCH BOLTS (std. & long) SPHERICAL WASHERS • SPHERICAL FLANGED NUTS • STRAP CLAMPS (two types) • HARDENED NUTS & WASHERS • FLANGED NUTS N/C & N/F • CUT THREAD STUDS • TEE-NUTS (twelve sizes) • COUPLING NUTS • ADJUSTABLE STEP BLOCKS • STAR TYPE HAND KNOBS • HEXAGON TYPE HAND KNOBS • KNURLED HEAD SCREWS

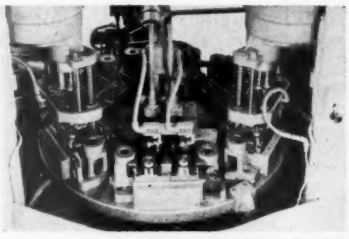
T-NUT & STUD SETS
STEP BLOCK SETS
PUNCH PRESS SETS

Northwestern
116 HOLLIER AVE., DAYTON 3, OHIO

An Automatic 6-Station Indexing Machine

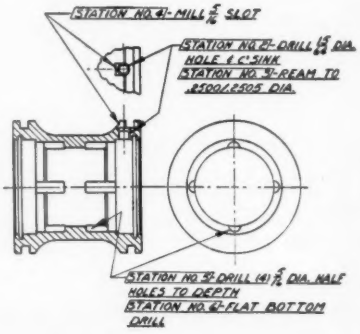
A new special automatic 6-station indexing-type machine recently developed is able to drill, ream, mill and countersink steering gear pistons at the rate of 440 per hour at 100% efficiency.

The specially designed fixtures and multiple spindle heads account for the high production rate. An unusual feature of the



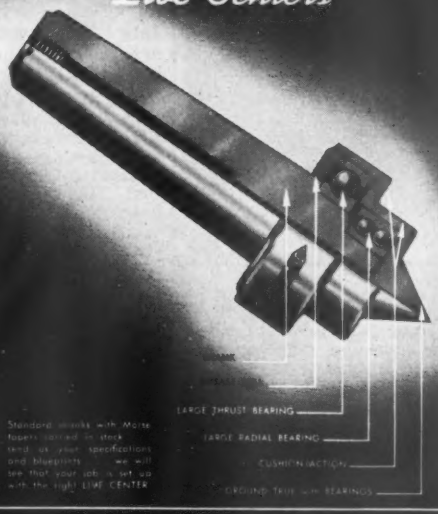
Photos courtesy Turner Brothers

fixture and clamping mechanism is the dead-center indexing table mounting a stationary cam track. Rollers, attached to the fixture clamping mechanism, pass through as the table indexes from station to station. Limit switches, also attached to the center, make it impossible for the machine to operate unless the parts are clamped in place. The multiple spindle drill heads have guide pins which enter bushings in the fixture before the actual machining operation takes place, insuring high accuracy.


STATION NO. 1 - MILL 5/16 SLOT
STATION NO. 2 - DRILL 15/32 DIA. HOLE & C'SINK
STATION NO. 3 - REAM TO .8100/.8105 DIA.
STATION NO. 5 - DRILL (4) 7/8 DIA. HALF HOLES TO DEPTH
STATION NO. 6 - FLAT BOTTOM DRILL

This machine was designed and constructed with standard bases and columns. As a standard policy of the manufacturer, this is done with all of their special purpose machines to keep manufacturing costs down.

ENGINEERED
Live Centers



Standard models with Morse tapers carried in stock and, at your specifications and blueprints . . . we will see that your job is set up with the right LIVE CENTER

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3908 F STREET • DETROIT 16, MICH.

THE **costliest cutting tool** IN YOUR PLANT—

No — it's not a tool of production — it's a tool of destruction! . . . it is ABRASIVE GRIT — by-product of your grinding, cutting and finishing equipment.

CYCLONE TYPE for tool and general grinding, polishing, woodworking, plastics, glass, ceramics, etc.

FILTER TYPE for grinders, drills, lathes, surface grinders, etc.

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A *MUST* FOR *DUST!*

These units trap dangerous dust *before* it can harm the health and efficiency of your employees and damage valuable machinery . . . These two distinct types of Duskolectors offer the best and most economical solutions to your special dust problems. Hammond *experience* will help you too, in eliminating the dust menace . . . Write today for bulletin.

Hammond Machinery Builders INC.

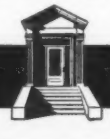
1631 Douglas Avenue • Kalamazoo, Michigan

Hammond OF KALAMAZOO GOOD MACHINERY SINCE 91

ANOTHER GRINDING ROOM PROBLEM SOLVED!

PATENTED

The small, precision-built machine you see above is the Radi-Form, a grinder attachment, that does almost everything but talk. The Radi-Form can move the work in a predetermined arc of any desired radius, from 1/16" to 2" concave, from .00 to 2" convex, which means that radii can now be generated even on carbide tipped cutting tools in a matter of minutes, to within .0005 accuracy on a standard, unformed, cupped diamond wheel. You save headaches, time, and gain increased production. Write for literature and prices that will surprise you.



W. F. MEYERS CO., INC., BEDFORD, INDIANA

ELIMINATE * HUMAN ERRORS WITH **INDICATING MICROMETER & COMPARATOR**

COMPARATOR MASTER MICROMETER GO-NO GO GAGE 1" RANGE IN 10000ths - NO GAGE BLOCKS NEEDED

* HUMAN ERRORS THROUGH DIFFERENCES OF "FEEL" ELIMINATED. WILL DETECT OUT-OF-ROUNDNESS, OVALNESS AND TAPER.

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HEIGHT GAGES

10" to 48"

Delivery from Stock

- EXTREMELY ACCURATE
- EXTRA HEAVY BASE AND BEAM
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- LONG SLIDES
- FAULTLESS WORKMANSHIP
- IN BEAUTIFUL WOODEN CASE

also FOSTER
6" to 96"
Precision Vernier
CALIPERS

WRITE

FOSTER SUPPLIES CO.
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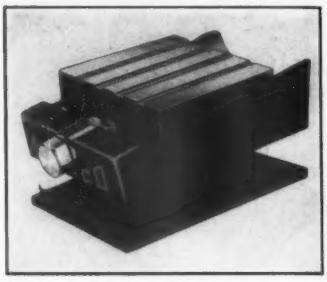
IMPROVED MACHINE LEVELING JACK
is 50% stronger, yet lower in height.



Engineering improvements have made this Jack 50%, stronger yet lower in height. This was accomplished by redesigning the Empco Jack so that the adjusting screw always remains cradled in the assembly. This insures full bearing of either front or back collar at any stage of operation.

Once the machine is set on Empco Jacks, the simple turning of adjusting screw, with a hand wrench will lower or raise the machine until your level indicator reads "zero". With this feature, periodic machine leveling can be done in a matter of minutes.

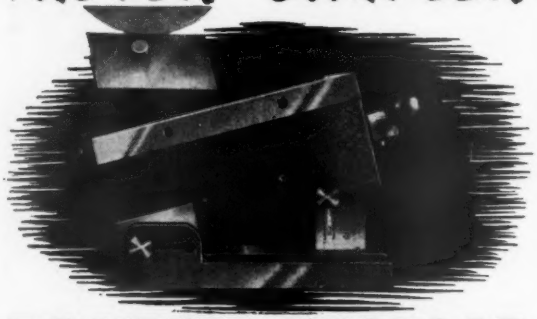
To reduce vibration, Vi-Sorb Mounting Pads are available with each style Empco Jack. These pads substantially reduce vibration, the percentage of reduction usually depends upon the thickness of the pad that is used.

Level machine installations with periodical re-leveling is essential to lower costs of machine maintenance. These costs are further reduced by the use of Vi-Sorb Mounting pads under every Empco Leveling Jack.

Available in three styles: JC-1 (standard) and JC-2 (heavy duty) pictured here, and the newest style JS particularly designed for use with anchor bolts. Many models in all styles with minimum height ranging from 1⅞" to 4".

For complete specifications and prices write the **Enterprise Machine Parts Corporation,** 2735 Jerome Ave., Detroit 12, Michigan.

FASTER-SIMPLER



POSITIVE ANGULAR ACCURACY

the MAGNA-SINE

SEND FOR CATALOG

For any angular set-up, whether single or compound, simply insert standard gauge blocks between the Magna-Sine plates. Proper gauge blocks are indicated in the Robbins Table of Constants. Positive accuracy in a few moments. Work is securely held by magnetic attraction. In two models and sizes; also non-magnetic models for inspection set-ups.

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...ufacturers of the MAGNA-SINE and Other Precision ...
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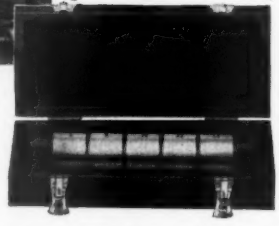
Check Surface Roughness Waviness and Lay INSTANTLY
. . . Right At The Machine

With ACME'S ROUGHNESS COMPARISON SPECIMENS



Consists of various surface specimens, *individually finished* to definite micro-inch readings, grouped together in one handy comparison bar. Merely hold bar opposite work for fast, visual comparison check of surface roughness, waviness and lay.

Available in groups of 3, 5 and 8 specimens. Low cost. Write for details, now!

Mfr's. of Drill Jig & Fixture Bushings

ACME INDUSTRIAL COMPANY

206 N. Laflin St.
Chicago 7, Illinois

THE SERVICE SHOP TO INDUSTRY FOR OVER A QUARTER CENTURY

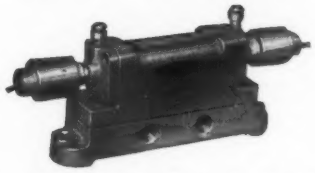
PROGRESS ON PARADE

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS — Mail FREE Inform-A-Gram Card for MORE Details

A New Larger Type of Lead Screw which increases the range of lead screws and "Auto-tap" lead screw tapping attachments from 5/16" to ⅝" is now being produced by Auto-

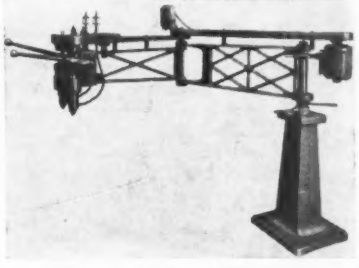
matic Methods, Inc., Div. 282, 965 W. Grand St., Elizabeth, N. J. Designed primarily for use with the 500 series "Auto-tap" Support Arm, this lead screw can be used for a variety of applications.
Circle Inform-A-Gram No. A1.

PILOT OPERATED 4-WAY SLIDE VALVES have been a recent addition to the line of air control valves produced by the NOPAK Division of the Galland-Hen-



ning Mfg. Co., Milwaukee 46, Ill. This new "V" valve can be piloted by cam, hand or foot control poppets or by solenoid pilots. The valves are fully described in a new 4-page bulletin available from the company.
Circle Inform-A-Gram No. A2.

A Number of Double Spindle Models have been added to the line of radial arm drills made by Ekstrom, Carlson & Co. One model incorporates a 30" radial reach, while another measures a full 71" reach. All the new drills have a

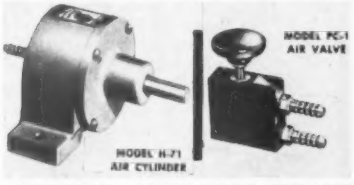


maximum vertical spindle travel of 4½", maximum vertical turret post adjustment of 6", drill chuck capacity of 0-3/8" and 1 hp spindle drive motors. For further particulars write Ekstrom, Carlson & Co., Dept. M-16, 1400 Railroad Ave., Rockford, Ill. **Circle Inform-A-Gram No. A3.**

DESIGNED FOR HIGH EFFICIENCY operation is the new Warner & Swasey 2-AC single-spindle automatic chucking machine which is a larger capacity model than the company's 1-AC version introduced in 1947. This machine, produced by Warner & Swasey, 5701 Carnegie Ave., Cleveland 3, Ohio, features front and rear cross slides and a five-faced overhead turret plus handles that work up to 10½" in diameter and up to 9" in turned length with tooling stations and controls easily accessible.
Inform-A-Gram No. A4.

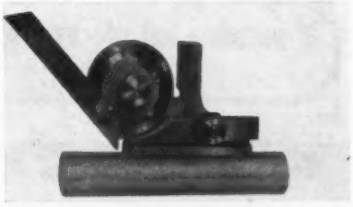
A New Air Gage, called the Air-O-Limit Model G Comparator, has been developed by Pratt & Whitney,

West Hartford 1, Conn. Features of this new gage include its high magnification, larger gage dial and the use of long wearing gaging plugs.
Circle Inform-A-Gram No. A5.



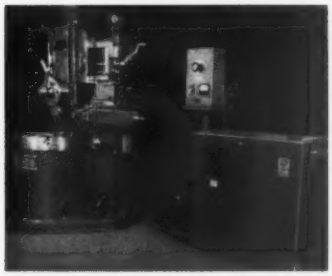
THE NEW AIR CYLINDER AND AIR VALVE illustrated are part of three new Air Clamps that have been developed by the Mead Specialties Co. Complete information on these clamps can be secured by writing to the company at Dept. CV-32, 4114 N. Knox Ave., Chicago 41, Ill. Circle Inform-A-Gram No. A6.

NEW UNIVERSAL BEVEL PROTRACTOR WITH VERNIER. The Mercury Supply Co., 410 Fairview, Elmhurst, Ill., announces this new bevel protractor



with Vernier which features an acute angle attachment for fast setting of fine angles and a new design detachable base which keeps the tool in an upright position at all times. Further information available by writing company.
Circle Inform-A-Gram No. A7.

A New Adjustable Speed Drive that provides unlimited table speeds up to 212 rpm on "Perfect 36" Vertical Turret Mills has recently been developed by the Rogers Machine



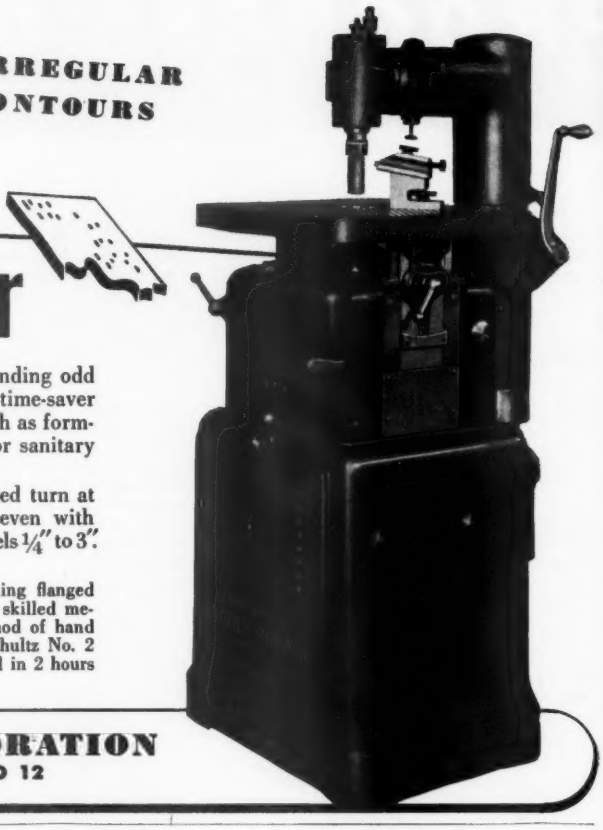
Works, 1400 Seneca St., Buffalo 10, N. Y. The power unit requires comparatively little floor space. The motor provided is designed for adjustable service and may be started and stopped without changing the speed setting.
Circle Inform-A-Gram No. A8.

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

FOR GRINDING ODD AND IRREGULAR SHAPES AND DIFFICULT CONTOURS

Boyar-Schultz No. 2

Profile Grinder



A Standard tool in tool and die shops where grinding odd shapes and irregular contours is necessary. It is a time-saver in grinding and fitting large dies and punches such as forming dies for refrigerators, table tops, large dies for sanitary ware and in automotive and locomotive shops.

Both spindles in the Dual Spindle Model illustrated turn at 10,000 R. P. M. giving rapid stock removal, even with small diameter wheels. Spindles accommodate wheels 1/4" to 3".

Form tool as illustrated, used for turning flanged car wheels, requires about 8 hours of a skilled mechanic's time when using the old method of hand filing and hand stoning. With Boyar-Schultz No. 2 Profile Grinder the form tool is finished in 2 hours . . . a saving of 6 hours.

BOYAR-SCHULTZ CORPORATION
2112 WALNUT STREET • CHICAGO 12

FRICTION SAWING WITH Tannewitz HIGH SPEED BAND SAWS

GREATEST COST SAVER IN METAL CUTTING

Tremendous savings of time and money are effected in trimming formed parts with Tannewitz High Speed Band Saws, for not only are the cuts made exceedingly fast, and smoothly, but in most cases no jigs or rests of any kind are required. Sheets of both hard and soft steel, and even such metals as 1" armorplate are handled with great advantage by this method, and it is ideal for trimming malleable and steel castings. By all means get the complete facts and learn of the many opportunities for boosting production and lowering costs that Friction Sawing with Tannewitz High Speed Band Saws offers. Write for circular.

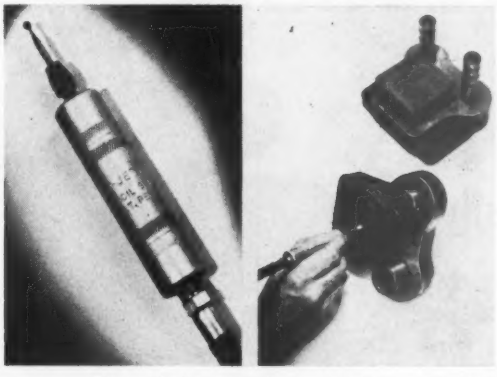
for trimming castings of all metals write for bulletin on "Foundry Band Saws".

☎ GL-6-1729

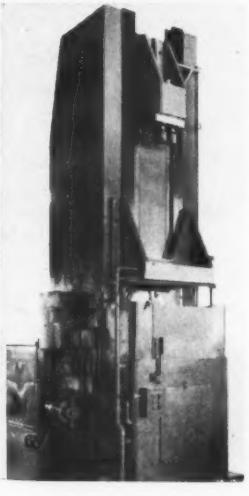
SAWING MACHINERY SPECIALISTS

The TANNEWITZ WORKS GRAND RAPIDS MICHIGAN

A New Pencil Grinder, the smallest and lightest there is, according to Nu-Jett Products, 1355 Michigan N. E., Grand Rapids, Mich., is now available from that

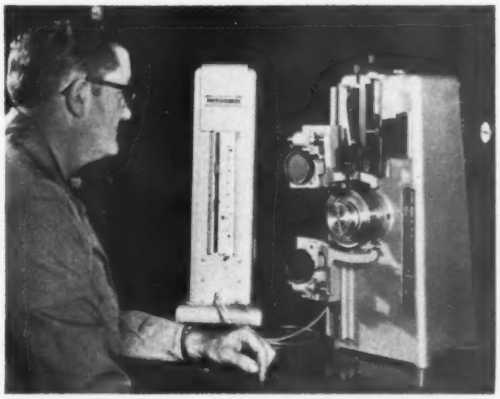


company. The grinder develops speeds up to 110,000 rpm. It is air-driven and will operate on pressures of 50 lbs. or more. Because of its high speed, it is particularly adapted to carboloy burrs. Photo at right shows grinder being used to polish a die. **Circle No. A9.**



Vertical Internal Pull-Up Hydraulic Broaching Machines are now being made in sizes ranging from 6-ton capacity, 36" stroke to 30-ton capacity with 60" stroke. The machine illustrated is the V-20-60 having a 20-ton normal capacity, 24-ton maximum capacity and a 60" stroke for handling broaches up to 66" long. These machines, produced by the Acme Broach Corp. of Milan, Mich., feature adjustable cutting speed and quick, convenient stroke adjustment, besides a two-control lever arrangement that requires the operator to use both hands as a safety factor. **Circle No. A10.**

A New Type of Radial Play Gage that uses a Sheffield "Plunjet" gaging cartridge and a column-type air gage for measuring play in ball and roller bearings has



been developed by the Sheffield Corp., Dayton 1, Ohio. This application of air gaging permits highly accurate measurement of radial play at higher amplifications than is possible with dial indicators. **Inform-A-Gram No. A11.**

IMMEDIATE DELIVERY
on SOCKET HEAD CAP SCREWS

. . . Up to 12" Long!
on ½", ⅝" and ¾" Dia. Screws
and No Special "Set-Up Charges"

WHY HOLD UP YOUR WORK . . . for long deliveries on those so-called "special length" screws? You can get really fast service on high-quality Socket Head Cap Screws, Stripper Bolts and Dowel Pins . . . AND you don't have to pay special set-up charges either! D-M-E's large volume turn-over enables you to get in on the savings!

SO . . . Why Wait? . . . When you can get the Finest Quality, in Less Time, and at Less Cost to you!

. . . for 1 or 100!

In STOCK at ALL 5 D-M-E Branches

Write for your FREE TABLE of TAP DRILL SIZES and Helpful Cap Screw Data . . . TODAY!

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IS NOW MADE OF STAINLESS STEEL THROUGHOUT
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• 3 GRADUATIONS - 1/1000" - 1/128" 1/10 mm in back

$14.75 PPD
Request illustrated folder showing complete line of MAUSER Toolmakers Calipers, Height Gages, Bevel Protractors and Tool Stands.
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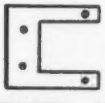
MADE TO YOUR SPECIFICATIONS
by
S.T.A.M.P., Inc.



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• In thicknesses from .001" up
• To tolerances of ± .0001"

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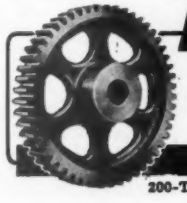

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NEW TUMICO HOLE LOCATER *Micrometer*

Makes Difficult Measurements Easily

● The Tumico Hole Locater Micrometer makes easy work out of many difficult measuring jobs. Note the round, ground, hardened and polished anvil which slips easily into hard-to-measure spots, holes and tubes. Measures accurately 0″ to 1″ in 1000 ths. Anvil may be loosened and turned or replaced to compensate for eventual wear. A real time saver with 101 uses.
Write for name of nearest dealer.

TUBULAR MICROMETER CO.
BOX 30
ST. JAMES, MINN.

IN PLANTS LARGE & SMALL **BARKER** BENCH TYPE **"MILLERS"** are performing countless close tolerance machining operations on big run jobs.

There's a need for one or more BARKERS in most plants today. You can easily effect a 50% economy in the milling costs of small parts.

Straddle milling using our standard stub arbor.

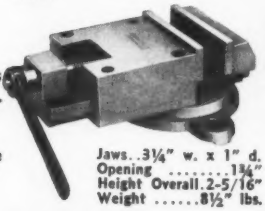
Shown here are a few of the many operations performed with BARKER MILLERS.

PRODUCTION MODEL

Exclusive 3-Way Travel

Milling Woodruff key-way in steel with standard cutter using up and down movement of head.

BARKER Graduated 3¼″ Swivel Base Vise.

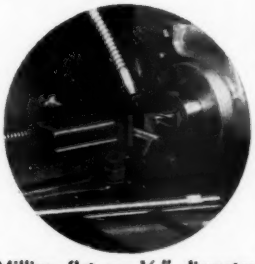


Jaws...3¼″ w. x 1″ d.
Opening .....1¾″
Height Overall.2-5/16″
Weight .....8½ lbs.

Slotting with our standard stub arbor.

We have hundreds of customers whose repeat orders signify satisfaction.

Get all the facts on this versatile "miller."



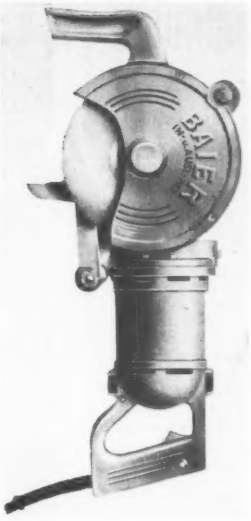
Milling flat on ½″ diameter steel shaft with standard ½″ end mill. Using up and down head movement.

Write For Literature and Complete Information

BARKER ENGINEERING COMPANY

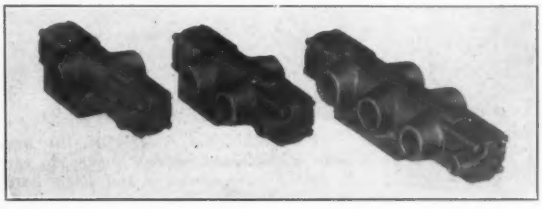
500 GREEN ROAD
CLEVELAND 21, OHIO

Portable Saw Permits Fabrication of Metal Parts on the job. Recently introduced to the American market by Alina Corp., 401 Broadway, New York 13, N. Y., is the new Baier Electric Metal Cutting Hand Saw. This unique saw will cut bar, angle, sheet and other shapes of metal stock right on the job. The Baier saw weighs only 17 pounds. Various applications include fabrication of metal on the job, repair and replacement of metal parts, tubes, structure, piping, plates, etc. The saw incorporates a 1/3 hp motor and will operate either 110 volts A.C. or D.C.

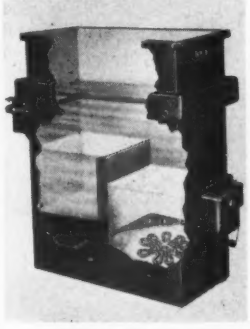


Inform-A-Gram No. A12.

Larger Capacity Basic Valves, ⅜ and ½ NPT sizes have been added as a companion line to the series of ⅛ and ¼ NPT size pneumatic and hydraulic valves



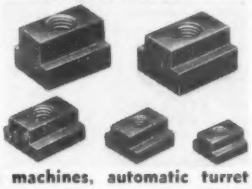
manufactured by the Versa Products Co., Inc., 249 Scholes St., Brooklyn, N. Y. Available in two, three and four-way types, the new sizes utilize the same size actuating devices used in smaller Versa valves.
Circle Inform-A-Gram No. A13.



A New Compact Vapor Degreasing Unit capable of handling 200 pounds of work per hour, either in baskets or as individual pieces, is being produced by Phillips Mfg. Co., 3445 W. Touhy Ave., Chicago 45, Ill. This new unit incorporates cool rinse, hot rinse and vapor degreasing because it has a rinse and boiling sump along with a water jacketed vapor area.

Inform-A-Gram No. A14

TEE NUTS, in 15 sizes to fit every machine tool application and eliminate costly toolroom machining, are being mass produced by Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland, Ohio. All sizes of the tee nuts are accurately machined of heat treated alloy steel with 200,000 psi tensile strength. It is reported this is the largest range of tee nuts ever offered in the component parts industry with throat sizes now available from 7/16" to 1 1/8". This vast range makes it possible to meet any requirement such as table slots and automatic cross slides on milling machines, automatic turret lathes, brakes, punch presses, shears, planers, etc., without resorting to costly custom making in toolrooms.

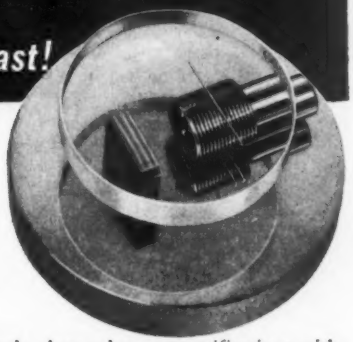


Circle Inform-A-Gram No. A15.

Measure in Millionths with LIGHT WAVES

It's Easy...Fast!

Determine Surface Flatness At a Glance



Meet today's extremely close tolerance specifications with modern scientific measuring equipment. Using Acme optical equipment, it is as easy to measure to millionths of an inch, as it is to measure in tenths with a micrometer. Make your measurements via light waves with Acme equipment. Write for complete information.

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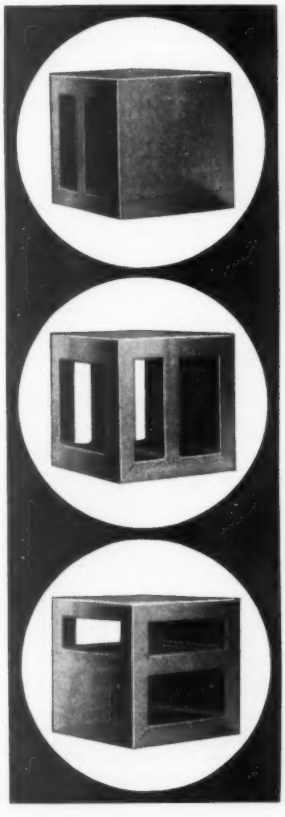

3 IN 1

COMBINATION TOOL

CHALLENGE UNIVERSAL BOX ANGLE

This new versatile tool has the clamping facilities of an *angle iron* . . . the stability, balance and accuracy of a box *parallel* . . . the perpendicular flat surface of an angle plate. Made of high grade special analysis semi-steel, heat treated and precision ground. Furnished in two sizes — 6x6x6 and 8x8x8 inches. Other sizes can be made to order.

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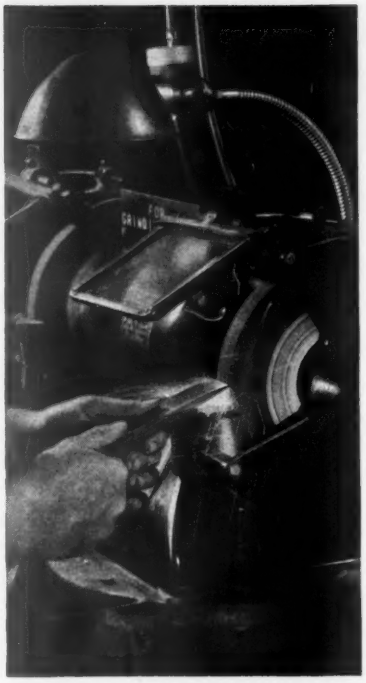
THE CHALLENGE MACHINERY COMPANY

Office, Factories and Show Room: Grand Haven, Mich.



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Choose the *right* grinding wheel for *every* tool grinding job—from the complete line by CARBORUNDUM.® That's the first step toward longer cutting life for your tools... lower maintenance costs in the tool room.

Every tool room grinding wheel by CARBORUNDUM is engineered to do a specific job at the lowest possible cost. You may want faster production of cutting angles, rakes and clearances; or perhaps better finish is more important; or cooler cutting. Whatever features, or combination of features, you may require—there's a tool room grinding wheel by CARBORUNDUM that's *right* for you. Whether you're grinding high speed steel, alloy, or cemented carbide cutting tools, not only these wheels but coated abrasive belts by CARBORUNDUM can help you cut costs.

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Two Helpful Booklets . . . "Maintenance of Alloy and High Speed Cutting Tools" and "Grinding Cemented Carbides"—tell you more ways to cut tool room maintenance costs. They're free—ask for either or both. The Carborundum Co., Dept. T P 81-316A, Niagara Falls, New York.

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WHAT EVERY TOOL ROOM TOOL MAKER OR MACHINIST NEEDS.

Plunger moves away from, instead of against the lever, protecting delicate parts from sudden or excessive jolts. Each graduation on scale represents 1/1000" movement of plunger. $7.50 plus postage.

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Drawbolt has positive lock to prevent slippage. Spindle: 9"x5/16". Block: 3¼"x2½"x1" with 90° angle groove in base. Surface Gage is precision ground. $8.75 plus postage.

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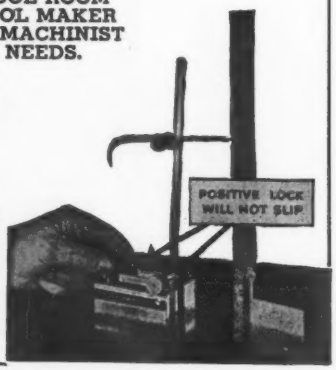

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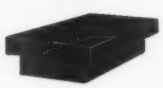
BLACK GRANITE SURFACE PLATES

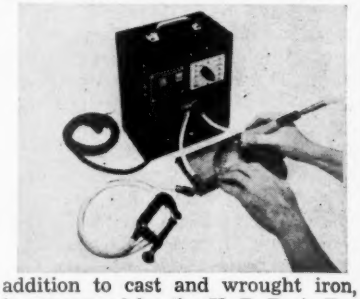
PERFECT PRECISION
Avoid substitutes
Immediate delivery in most sizes from 9x12 to 48x144.
REQUEST BULLETIN and name and address of Distributor nearest you.

Present an absolute continuous bearing surface, finished up to 50 millionths inch. Incredibly smooth. Falling objects do not cause bumps. Being harder than hardened steel, can take greatest mistreatment without causing inaccuracy of surface. No oiling. Will not rust or warp. No re-scraping. Most durable.



COLLINS MICROFLAT CO., 2326 E. 8TH ST., LOS ANGELES 21, CALIF.

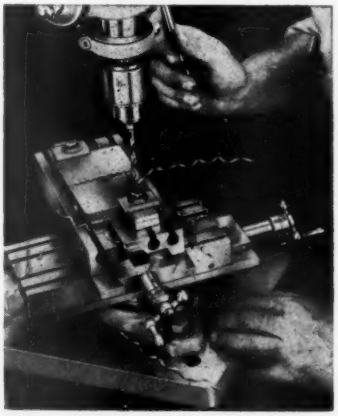
A New Portable Electric Marker in standard and heavy duty sizes for free-hand electrical marking on all steels before or after hardening, alloy steels and ferrous alloys, in



addition to cast and wrought iron, is announced by the H. P. Preis Engraving Machine Co., 282 Industrial Branch, Hillside, N. J. For gage blocks, highly finished precision dies and parts the intensity of the marker can be controlled.
Circle Inform-A-Gram No. A16.

THIS FLEXIBLE WRENCH for hexagon socket-head screws makes it easy to quickly turn screws in and out of hard-to-get-at places. The wrench is made by Aetna Mfg. Co., Bensenville, Ill., and comes in sizes to fit screws from #6 to 5/16 cap screws and from #10 to 7/16 setscrews. Circle No. A17.

A Useful Accessory for combination angular and straight line cuts on shapers, milling machines and grinders is offered by South Bend Lathe Co., South Bend 22, Ind., in



its new Universal Table. When used on a drill press, it spaces drilled holes and by chucking an end mill, the drill press converts to a light milling machine. By attaching the table to the face plate of a lathe, spaced holes for jigs can be bored with micrometer accuracy.
Circle Inform-A-Gram No. A18.

COMPLETE THE DIE-SET AT YOUR BENCH

Lacey Die-Set Machine

Here's a truly "one man" press. It operates with one hand. Handy for tool and press rooms, it permits the diemaker to complete a die-set at his bench . . . saves toolroom and handling costs. Ask today for full details.

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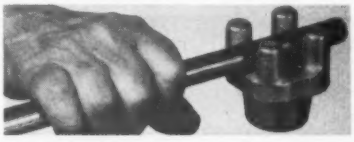
The world's best . . . one-piece, drop-forged—not welded—of mild carbon steel, heat-treated, with head accurately milled for standard tables on lathes, planers, boring mills, milling machines. Integral washer and nut. Sizes: up to 30". Typical direct prices for 10" lengths: ½ — $1.36; ⅝ — $1.36; ¾ — $1.58; ⅞ — $1.89. Write for price list

THE O K TOOL COMPANY, INC., Milford 8, N. H.

Bar Knobs made of malleable iron and cadmium plated are now being made by Morton Machine Works, 2421 Wolcott, Detroit 20, Mich., Dept. 83. The bar knobs come in standard



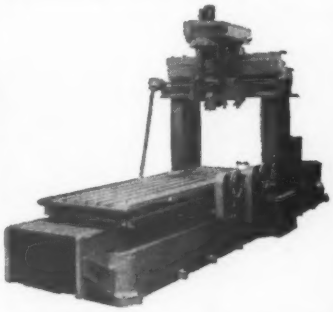
sizes of 2½" and 3½" diameters. 2½" sizes with holes reamed and tapped ½", ⅝", or ¾"; 3½" size with holes reamed and tapped ¾", ⅞" or 1 inch. **Circle No. A19.**

POWER BLADES for use in power sawing or cut-off machines will be marketed under the trade name, "Illinite", reports the Illinois Tool Works, 2501 North

Keeler Ave., Chicago 39, Ill. Designed to cut today's new metals, including the tough, dense alloys, at high speeds and feeds, these power blades will be available in a complete range of popular sizes to fit standard sawing machines.
Circle Inform-A-Gram No. A20.

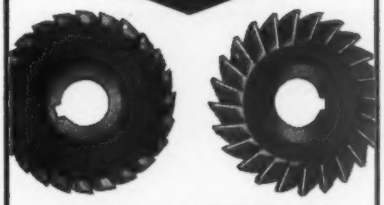
GRANITE SURFACE PLATES have been added to the line of precision layout and inspection equipment produced by the Taft-Pierce Mfg. Co., Woonsocket. The plates are precision ground and lapped and the surface accuracy is not affected by ordinary temperature changes.
Circle Inform-A-Gram No. A21.

An Important Feature of the new Morey 40M "Aeroframe" Profiler and Milling Machine is its new 10-



foot table with full support bed. This machine, a product of Morey Machinery Co., 410 Broome St., New York 13, N. Y., is especially suitable for large forgings and castings. **Circle Inform-A-Gram No. 22.**

Since 1912 WE'VE HELPED SHOPS SAVE MONEY



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YOUR CUTTING TOOL COSTS can be cut by converting worn and obsolete high speed and carbide cutters for other jobs. Let us help you set up a tool salvage program.

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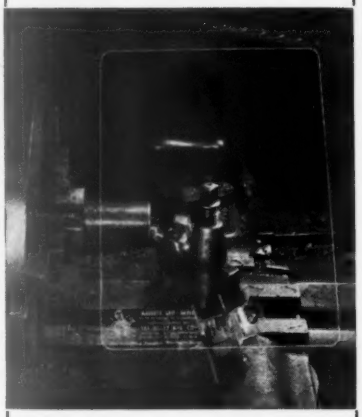

Look at the picture. Note the tru-vision thru these sturdy plastic guards . . . magnetically-instantly positionable on any machine. Let today be your turning point to proven . . . effective . . . modern guarding. Literature on request, or order six 8″x10″ units today.

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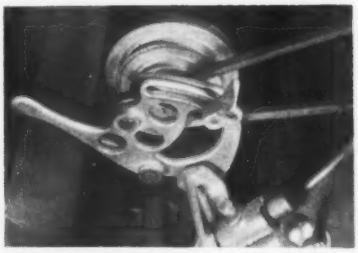
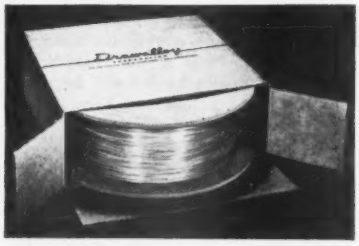
This R-C Slo Speed Attachment for drill presses is of sturdy cast iron construction and can be installed without any drilling or tapping. It allows free movement of

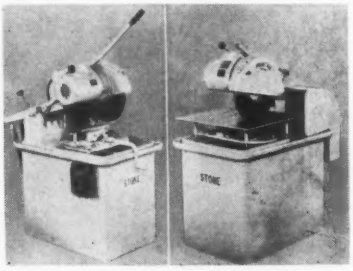


the head, both vertically and radially and equal and proper belt tension may be attained. The attachment is a recent development of R-C Specialties, 1641 W. 135th St., Gardena, Calif.
Circle Inform-A-Gram No. A23.



SPOOLED WIRE for automatic insert arc welding is now being produced by the Drawalloy Corp. in its new and enlarged plant on the Lincoln Highway West at Alloy St., York, Pa. The wire is precision-wound on labeled spools, easy for distributors and users to identify, stock and handle.
Circle Inform-A-Gram No. A24.

The Stone Heavy Duty M75 cut-off machine is now available as an interchangeable machine that can be used as a regular cut-off unit or converted in five minutes for free-hand cutting of gates and risers from non-ferrous foundry castings and other uses. The machine shown



at left in the regular cut-off position and at right for free-hand operations. Users of this machine can cut all materials at a rate of less than four seconds per square inch of metal. Further data available from Stone Machinery Co., Inc., 527 Fayette St., Manlius, N. Y.
Circle Inform-A-Gram No. A25.

The Model 1100 Hybco Tap Grinder

• **Capacities No. 0 Mach. Screw to 1½″ Hand Taps.**

Representatives in Principal Cities

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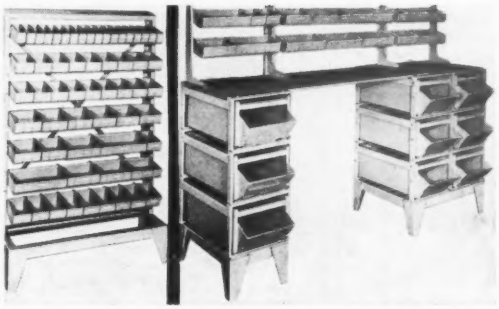
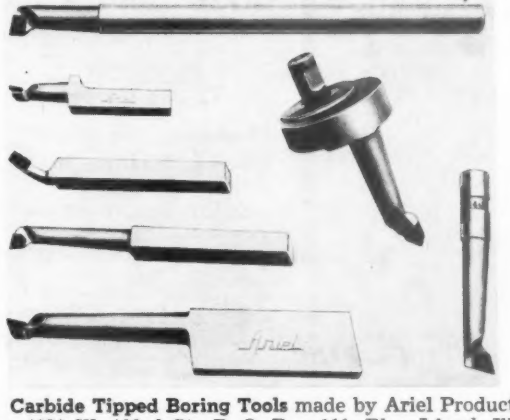
BLOOMFIELD TOOL CORPORATION
30 Farrand St. Bloomfield, N. J.



Equipment for Parts Handling and Storage are now being produced in a complete new line by the Bathey Mfg. Co., 190 S. Mill St., Plymouth, Mich. Included are standardized pressed metal pallets, tote pans and tote pan adapters and small part bins which may be assembled without tools into infinite arrangements to suit current production. **Circle Inform-A-Gram No. A26.**

A New Indicator Height Gage and an Adjustable Inspection Block that provide faster, more accurate precision inspection and layout work have been developed by Tietzman Tool Corp., Englewood, Ohio. This new block is adjustable in millionths of an inch thru a range of .250" vertically. **Circle Inform-A-Gram No. A27.**



Carbide Tipped Boring Tools made by Ariel Products Co., 4050 W. 123rd St., P. O. Box 111, Blue Island, Ill., are especially useful in toolrooms, particularly where an operator must make many setups to complete one job. They save much energy and time by being self-contained —slip it in the tool post, align and tighten. The tools are case hardened with resilient cores inside to keep them from breaking. A handy 4-page brochure on Ariel tools is available upon request. **Circle No. A28.**

NOW! SAVE ON SET-UP TIME!

With Faster Cutting

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MACHINE ANGLES, DRAFTS or RELIEFS **TOPS** IN SMOOTH CUTTING PERFORMANCE

WITHOUT TILTING THE MACHINE HEAD OR THE WORK PIECE!

You can take Faster, Smoother cuts, WITHOUT CHATTER. Made from the finest High Speed Steel to prevent breakage and costly "down time". You'll save Time and Money with D-M-E Tapered Milling Cutters!

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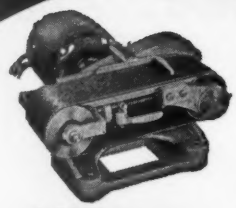

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The precision of a machine tool plus the durability of a workhorse. Complete with ½ H.P. Heavy Duty Motor and automatic band tension control. Nothing like it for finishing metals, plastics, wood, fibre, etc.

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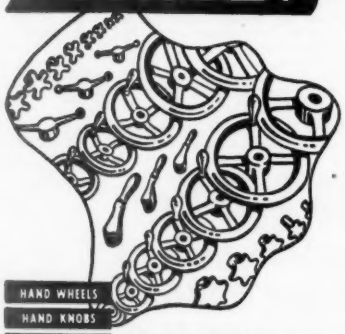

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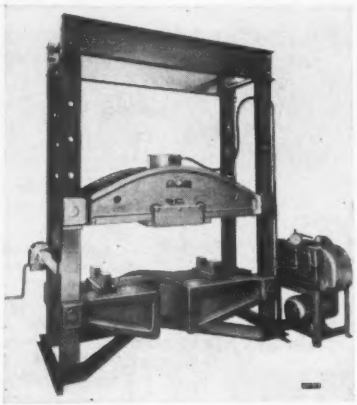
A New Open Yoke Press has been introduced by Rodgers Hydraulic, Inc., 7450 Walker St., St. Louis Park, Minneapolis 16, Minn. This 3-in-1



press incorporates all of the features of the standard shop presses and has a fully machined yoke bed.
Circle Inform-A-Gram No. A29.

AN IMPROVED KEY TYPE HYDRAULIC CYLINDER is now being produced by Carter Controls, Inc., 2920 Bernice

Road, Lansing Ill. This new cylinder has a number of features such as a long mechanite rod and an easily held bear-insert. Circle No. A30.

Joining the Ends of Round Leather Belting is made easy with a new simple device now being marketed by Louis Levin & Son, Inc., 728 East Pico Blvd., Los Ange-

les 21, Calif. The upper illustration shows how a two-inch taper is made by trimming the belt with a razor blade. The middle illustration shows the belt ready for cementing. The bottom photo shows one of the clamps before it is applied. **Inform-A-Gram No. A31.**

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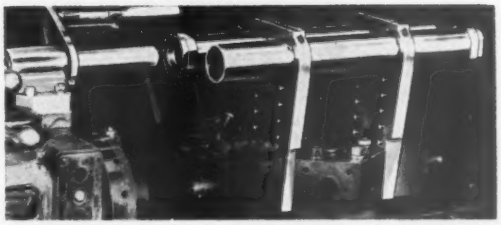
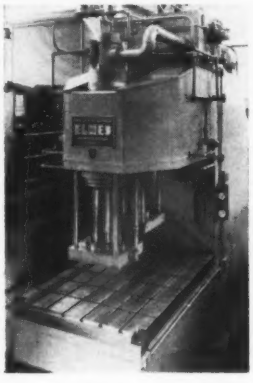
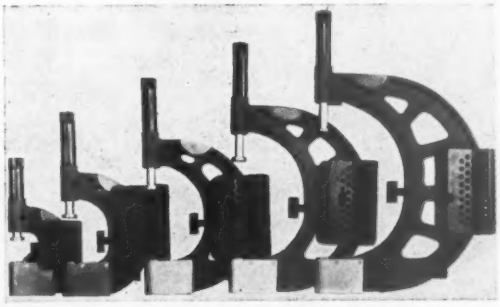


A New Pilot Bar Attachment, that reduces vibration chatter, holds closer tolerance and assures precision cuts on #3 and #4 Warner and Swasey Ram Type Turret Lathes, has been developed by the Viking Tool and Die Co., 3520 E. 43rd St., Minneapolis, Minn. This "Dual" pilot bar eliminates rejects by increasing the precision of finish-cuts. **Circle Inform-A-Gram No. A32.**

The New Apex 20" Disc Sander and Grinder has a reversing switch with motor overload protection as one of its major features. The reversing action permits efficient surfacing of right and left hand jobs. The Apex machine also will remove and shape metals, plastics and wood to close tolerance. Literature will be sent upon request to Rankin Bros., Precision Machine and Tool Works, 11090 S. Alameda St., Lynwood, Calif. **Circle No. A33.**



The Elmes Hydraulic Flanging Press shown here is so designed that both cylinder assemblies can be operated in unison, providing a total frame capacity of 600 tons, or each 300-ton cylinder assembly can be operated as an individual press, completely independent of the other cylinder assembly. Illustrated booklet available from American Steel Foundries, Elmes Engineering Div., 1150-Y Tennessee Ave., Cincinnati 29, Ohio. **Circle No. A34.**



Contact Type Air Snap Gage Developed. A new adjustable air snap gage, with a different operating principle, has been produced by Federal Products Corp., 1144 Eddy St., Providence 1, R. I. The workpiece can be positioned directly on the flat, tungsten carbide gage anvils of this instrument and the user can feel when the piece is in the gaging head correctly. **Circle No. A35.**

Only SUPERBORE GIVES YOU Each COUNTERBORE AND DRILL IN 3-SIZES TO DO THE JOB.. Right!

- Finest High Speed Steel
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When you tackle that production problem . . . remember there's only one right answer. SuperBore drills and counterbores provide that answer every time because they give you the advantage of oversizes . . . the shade of size difference that means **perfect** results. SuperBore drills and counterbores come in a set consisting of standard sizes* or oversizes above the standard dimensions.

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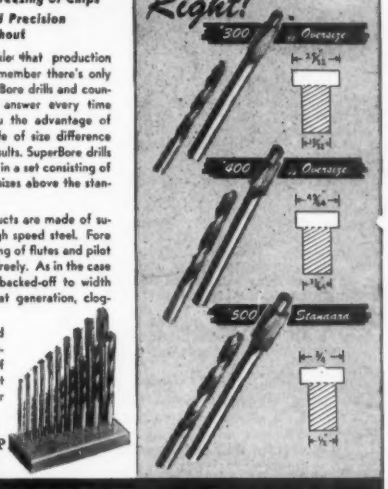

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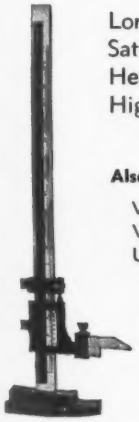

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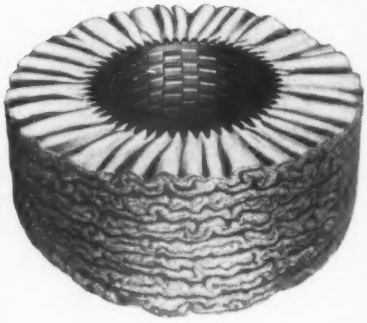
Boring and Internal Profiling of engine parts can be done on this new machine recently introduced to the American market by Morey Machinery Co., Inc., 410 Broome St.,

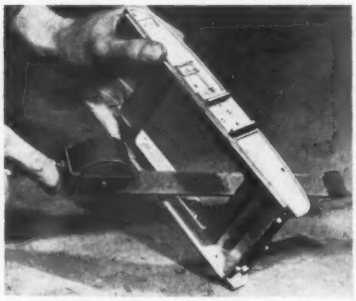
New York 13, N. Y. Called, the Alfing Model HF 1/1000, this machine permits the design of jet engine shafts and rocket tubes of any desired length and interior profile. **Circle Inform-A-Gram No. A36.**

New "Permanized" Bias Sisal Buffs are now being produced by the American Buff Co., 2414 S. LaSalle St., Chicago 16, Ill. Reports



are that there is a rapid increase in the use of the buffs by metal finishers due to the company's exclusive "permanizing" process that locks the sisal fibres permanently together. **Inform-A-Gram No. A37.**

A New "Abrasive File"—used like a conventional metal file, but with a cutting surface that feeds from a coated abrasive roll—has been developed by Monarch Machine Shop,



Inc., Madison, Wis., and Minnesota Mining and Mfg. Co., 900 Fauquier St., St. Paul 6, Minn. Called the "Red Flask" abrasive file, the new hand tool is designed for deburring and other metal filing and finishing operations. **Circle No. A38.**

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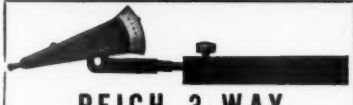

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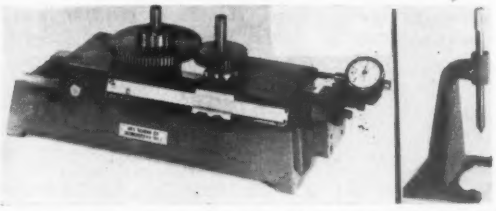
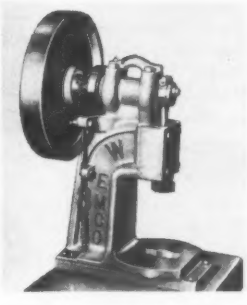
A New Gear Tester with a base of sturdy flame-hardened meehanite and a floating head that rests upon ultra-precision steel balls for extreme sensitivity, has

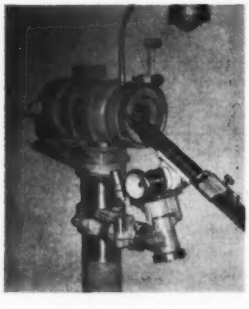


been developed by the George Scherr Co., 200 Lafayette St., New York 12, N. Y. The floating head contacts a dial gage reading in .0005". For measuring center distance, a rustproof scale and vernier (right) is furnished reading in .001 inches. **Circle Inform-A-Gram No. A39.**

Bench Type Power Punch Presses in the Emco line and produced by the Klaas Machine & Mfg. Co., 4314 E. 49th St., Cleveland 9, Ohio, have been improved to afford increased die space. Also, a new clamping device has been added in the ram to afford a more rigid way of gripping and to do away with set screws.

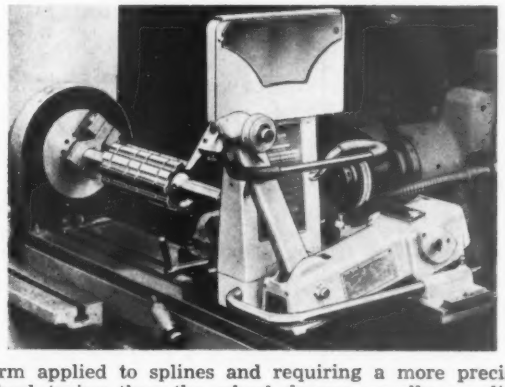
Inform-A-Gram No. A40.





Model "DA" Sterling Drill Grinders have been improved to the extent that simple adjustments for changing drill sizes are made speedier by replacing two common hex nuts, requiring wrenches, with quick action levers. Other minor refinements have been made and complete details are available from McDonough Mfg. Co., Eau Claire, Wis. **Circle No. A41.**

Pratt & Whitney's Diaform Wheel Forming Attachment is now being effectively and efficiently applied to spline grinding machines. This diversion is a result of the growing use throughout industry of the involute



form applied to splines and requiring a more precise wheel truing than the wheel dresser usually supplies on such machines. The photo shows the P & W Diaform attached to a spline grinder and with an involute form-template on the mounting bracket. **Circle No. A42.**

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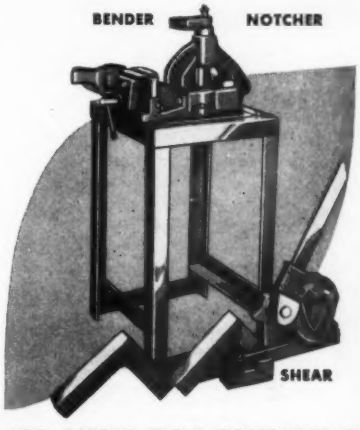

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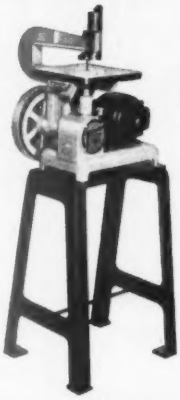

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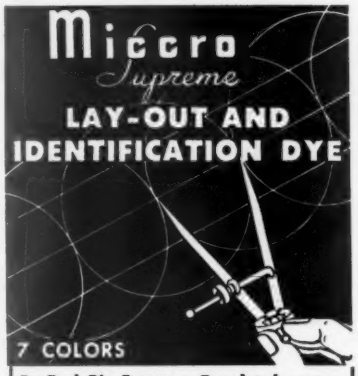

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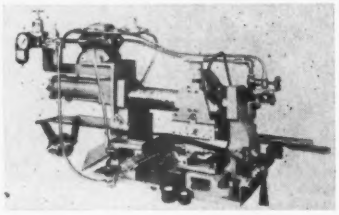
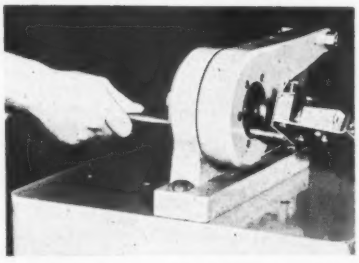
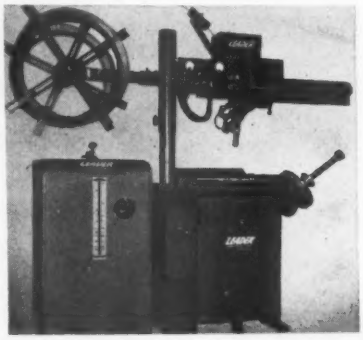


duced by the Acromark Co., 439 Morrell St., Elizabeth, N. J. Operated from standard air lines used in most shops and requiring only 75 psi, this new arrangement provides essentially automatic production marking on plastic, metal or parts of other materials.
Circle Inform-A-Gram No. A43.



This New Micro-Matic Gage makes it possible now to maintain in excess of 9,000 cuts per hour in bar stock with the Di-Arco Power Rod Parter. The gage is a development of the O'Neil-Irwin Mfg. Co., 626 8th Ave., Lake City, Minn.
Circle Inform-A-Gram No. A44.

The Leader Automatic Welding Machine (Model 550) has been improved upon with the addition of the following features: A new, automatic self-adjusting high frequency arc starter; finger-tip speed drive



control; a new Acme-thread powered horizontal arm lift and new flux handling equipment. Further information available from Leader Welding and Mfg. Co., 2418 6th St., Berkeley 2, Calif. **Circle No. A45.**

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With the AMIC "Quick-Action"
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AT NEW LOW PRICES

The perfect tool for machine shop, tool room inspection and Quality Control. A flick of the thumb and you've got your external and internal dimensions. Knife-edged hardened jaws provide exact thread measurements. A depth gage blade gives speedy measurements. AMIC designed and made exclusively for AMIC by an outstanding European manufacturer.
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Size 6" No. 22B, Graduation 1/40", vernier reading .001.
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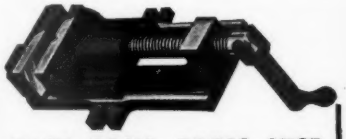

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• This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.
OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
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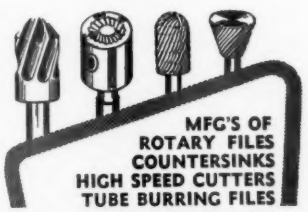

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BEAVER
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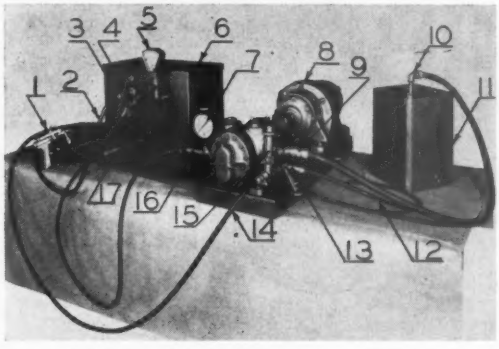
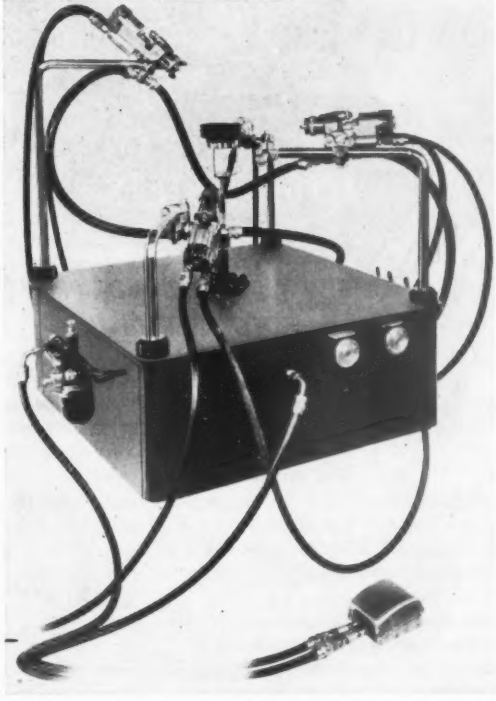
Los Angeles 11, Calif.

A Considerable Decrease In Waste is anticipated with the advent of this new-type spray painting machine that employs hydraulic pressure combined with heat. This airless spraying device, a product of Bede Products, Inc., 1110 Brookpark Rd., Cleveland 9, Ohio, is expected to eliminate elaborate spray booths, reduce maintenance costs sharply and do away with

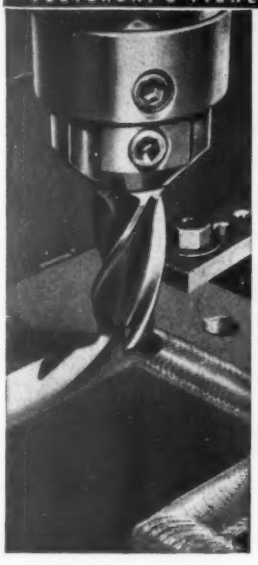


many painting health hazards. The component parts of the machine are: (1) the spray gun; (2) heated paint hose to gun; (3) heater outlet; (4) strainer; (5) temperature gage; (6) paint heater; (7) pressure gage; (8) electric gearhead motor; (9) pump outlet; (10) syphon rod; (11) paint supply, either pail or barrel; (12) drainout hose; (13) shut-off valve; (14) return hose from gun; (15) pressure regulator; (16) pump outlet; (17) heater inlet.
Circle Inform-A-Gram No. A46.



A New Automatic, Single-Spindle Painting Machine, which for shorter runs eliminates the necessity of investing in costly conveyorized painting systems, has just been developed by the Confirming Matrix Corp., 416 Factories Bldg., Toledo 2, Ohio. It is being produced as a "portable package" which can be used in most standard spray exhaust booths.
Circle Inform-A-Gram No. A47.

YESTERDAY'S PIONEER · · · TODAY'S LEADER



HEAVY DUTY END MILLS and HOLDERS

(Both are Stock Items)

● Look at this rugged 2″ diameter Weldon end mill with 4″ long flutes which made a 2½″ deep cut in a solid block of die steel—4140 steel heat treated to 260 Brinnell. The feed was 1½″ per minute, and the material was removed at a rate of 7½ cubic inches per minute.

This HEAVY DUTY Weldon end mill is held by a new-style end mill holder which bolts securely on to the nose of the milling machine spindle. The holder, located by a centering plug, is driven by two drive keys on the spindle nose. The 2″ diameter shanks of these heavy-duty end mills are securely held by two large hollow head screws.

For top performance and sturdy long life in end mills—large or small—look to Weldon.

Weldon distributors throughout U.S.A. and Canada carry complete stocks to serve you

SEND FOR LATEST CATALOG NO. 10

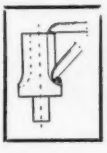
THE WELDON TOOL COMPANY

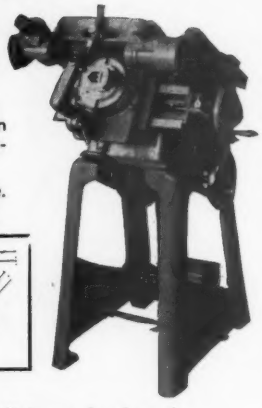
3000 WOODHILL ROAD · · · CLEVELAND 4, OHIO

Punches Shaped from the SOLID with OTTMANN Punch Shaper

FEATURES:

1. No holder plates required.
2. Simple work mounting.
3. No re-setting — Work can be adjusted to any position of tool.
4. Forms shaped accurate. Parallel and true.





5. Minimum hand work.
6. Convenient, simple operation. Uses standard shaping tools.

Write for Literature

CEDAR-WEST TOOL CO., INC.

90 WEST ST. NEW YORK 6, N. Y.

"Packaged Precision"

COMTORPLUG measures high-precision holes to fractions of .0001"

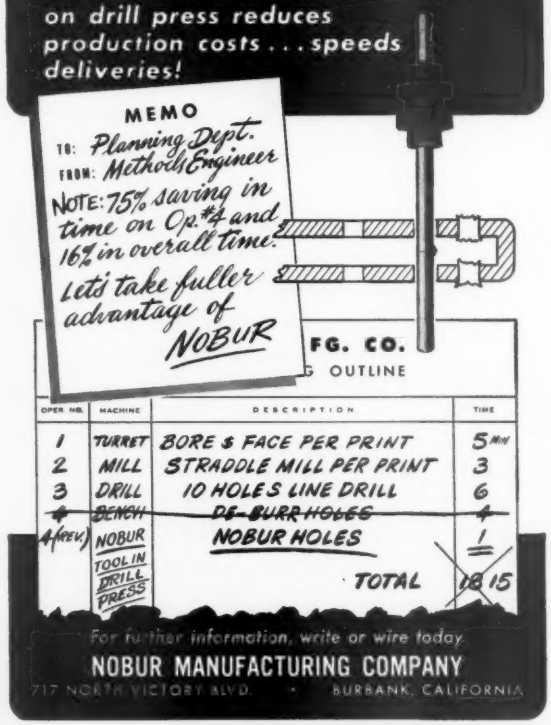
Here in a compact, self-contained unit you have the high precision that has found so prominent a place in the jet engine program. Used at machine or bench, it has self-aligning features assuring accuracy. "Just right" for Statistical Quality Control programs.

Request Bulletin 46

COMTOR CO. 82 Farwell St. Waltham 54, Mass.

Deburring with NOBUR tool

on drill press reduces production costs . . . speeds deliveries!



MEMO

TO: Planning Dept.
FROM: Methods Engineer

NOTE: 75% saving in time on Op. #4 and 16% in overall time!

Let's take fuller advantage of NOBUR

FG. CO.
OUTLINE

OPER NO.	MACHINE	DESCRIPTION	TIME
1	TURRET	BORE & FACE PER PRINT	5 MIN
2	MILL	STRADDLE MILL PER PRINT	3
3	DRILL	10 HOLES LINE DRILL	6
~~4~~	~~BENCH~~	~~DE-BURR HOLES~~	~~4~~
4 (NEW)	NOBUR TOOL IN DRILL PRESS	NOBUR HOLES	1
		TOTAL	15

For further information, write or wire today.

NOBUR MANUFACTURING COMPANY

717 NORTH VICTORY BLVD. • BURBANK, CALIFORNIA

"M-40-U" ALLOY CENTERS

Give You PRODUCTION-PROVEN "DEEP CORE DESIGN"

Get more for your center dollar with Gorham "DEEP CORE DESIGN!" "M-40-U" Alloy Centers are PRODUCTION-PROVEN in the largest plants. They consistently outlast high-speed and other alloy centers, stand far more abuse. Although equal to carbide in wear resistance, they cost less, are easier to redress.

And Gorham's exclusive "DEEP CORE DESIGN" allows many more redressings, too! A core of "M-40-U" Alloy, developed by Gorham expressly for wear, abrasion and heat resistance, is induction brazed deep in the shank, after which the entire center is finish ground, giving you wear material permanently supported by tough shank steel!

Gorham "M-40-U" Alloy Centers are available with Morse, B. & S. or Jarno taper shanks. Immediate delivery on popular sizes, "specials" to specification. Free literature gives description, dimensions, prices. Send for your copy today.

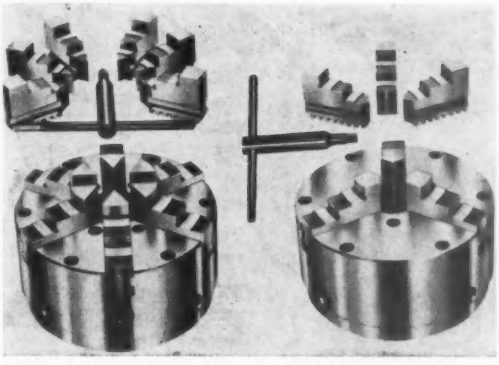
"DEEP CORE DESIGN"

Gorham TOOL COMPANY

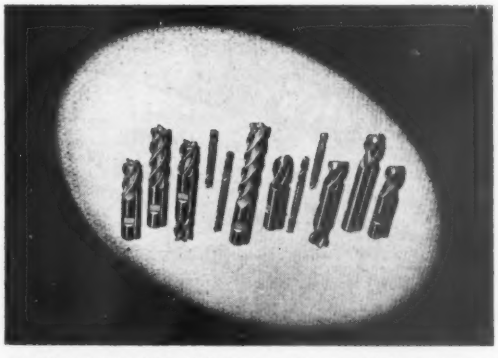
"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

14415 · WOODROW WILSON • DETROIT 3, MICHIGAN

WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.



This 9" Adjust-Tru Chuck embodies all the features of the smaller Adjust-Tru chucks including .0005" precision within 1 minute of original chucking, plus the rechucking speed of scroll chuck operation. Developed by the Buck Tool Co., 2015 Schippers Lane, Kalamazoo, Mich., this chuck holds up to 8" diameter. Complete information gladly furnished upon request.
Circle Inform-A-Gram No. A48.



THESE NEW END MILLS have been added to the standard line carried by Goddard & Goddard Co. They include long sizes, extra long sizes and small diameters. It is believed that this complete line, now, will cover the majority of all end milling applications. Write to Goddard & Goddard Co., P.O. Box 68, Brightmoor Station, Detroit 23, Michigan, for free catalog. **Circle Inform-A-Gram No. A49.**

PORTABLE POWER SAW HAS 360° ROTABILITY. This Key-Hak attachment fits any heavy-duty ¼" electric air drill or motor driven shaft. Drills with chuck speeds of 2,000 to 3,000 rpm are the most desirable units. The attachment is designed to cut directly—without the aid of a starting hole—into 20 gauge or lighter sheet metal as well as into wood of any thickness. The in-line mechanism of this precision-built tool affords the operator complete control when cutting in any direction. Three ball bearings used in the drive and crank mechanism assure smooth operation and maximum life of the tool. It is ideally suited for installation, maintenance and production jobs. The manufacturers of the Kek-Hak attachment, Producers and Distributors, Inc., 714 S. Sixth St., Allentown, Pa., have prepared a folder giving specific information on the selection of blades for the various materials to be cut.
Circle Inform-A-Gram No. A50.

Collet capacity 5/16" or 5/8", swing 4", bed 18" long.
6 position self-indexing turret with 1/2" holes.
Immediate delivery of lathes and tools.

LEVIN® Jewelers type lathes for fine instrument work and second operations. Collets as small as .004". Send for catalog. Louis Levin & Son, Inc., 782 E. Pico Blvd., Los Angeles 21.

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on DRILL JIG BUSHINGS
...at the flip of a single page
Make drill jig designing easier with this "Flip-a-page" catalog.
Free on Request
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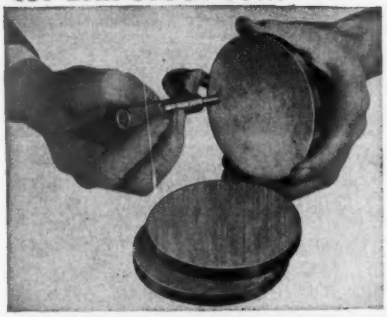
31780 GROESBECK HIGHWAY
FRASER, MICHIGAN

Atlantic
RAKER SET BANDS
CUT BAR STOCK TO...



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Sections of bar stock are cut to exacting tolerances for bodies of NELCO carbide face mills, side mills and allied products. Atlantic raker set band saws do the job better—no travel, no scored faces. A section of cut bar stock selected at random from production cutting measured to a tolerance of .002 from top of cut to bottom—an outstanding example of precision Atlantic band saw operation.

For all operations requiring a tough—true running band saw — when cuts **must be absolutely perpendicular to the axis of the stock** — for uniformity . . . for precision . . . look to Atlantic Saws. Try them on your equipment for amazing results!

FREE! THIS PICTORIAL STORY on Atlantic RAKER SET BANDS. Send for your copy today. Have you a specific application you are wondering about? Include a brief description — it will meet with interested, engineering attention and be promptly acknowledged

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ATLANTIC SAW MFG. COMPANY, Inc.
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Men who had to "lick" the very problems you're facing designed... ROUSSELLE PRESSES

That's why they're fast, accurate, so adaptable, so easy to operate. Why maintenance is simple. Why initial cost is low . . . Often considerable savings and improved punch press operations are possible if you let our engineering staff assist you. There is no obligation. Simply furnish the details relating to your need or problem and if possible send samples or drawings of the work. You will hear from us promptly.

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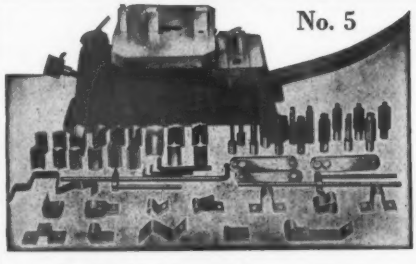
Any decimal diameter to ½"—in any length. Mirror finish surface to gage tolerance. Many uses — punches, gages, measuring wires, special tools, etc. Quick delivery.

Write or Phone ORange 3-4301 for price list D-3

WILLIAM T. HUTCHINSON COMPANY
235 Main St. Orange, N. J.



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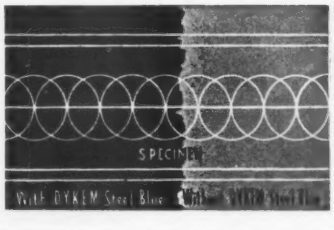
Multiform
BENDER-CUTTER
CUTS, BENDS, PUNCHES

Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛"x1½" as illustrated. Punching and round end blanking dies available. Other models up to ¼"x 4" air operated.

ALSO AIR OPERATED MODELS.

J. A. RICHARDS CO. KALAMAZOO, MICH.



DYKEM STEEL BLUE
Stops Losses in Making Dies and Templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

THE DYKEM COMPANY
2303L NORTH 11TH ST. ST. LOUIS, MO.

. . . Automatic Cycling, from page 70

circuit and also removes current from the bank contacts during stepping.

The terminals on these units provide for soldered connections. In telephone use, the wires are usually No. 22 solid, with comparatively thin acetate insulation, No. 16 stranded wires with 2/64-inch insulation is usually necessary. The wires are terminated in a plug—such as the Jones type—to provide fast servicing or replacement.

A spare plug-connected stepping switch should be furnished for all applications to help overcome customer resistance to the use of such equipment.

If the coil terminals on the type 44 seem to be too close to the frame, the manufacturer will furnish an extra insulating washer.

This equipment costs about $30.00. It seems quite unlikely that any industrial control manufacturer will bring out a heavy-duty device of the same type, so it would be just as well to plan to use the present equipment, subject to the previously outlined limitations.

Due to the nature of their construction, telephone relays have an inherent wiping action of the contacts. On these relays, paralleled contacts are fairly easy to provide, and definitely give less trouble than single contacts. With this in mind, one control manufacturer is designing relays having a slight wipe, and optional paralleled contacts.

The North Electric Company of Galion, Ohio, has a number of installations of unattended all-relay dial switching equipment with paralleled contacts. In many cases this equipment has been padlocked for 12 to 16 years before requiring any service. Such performance, although in a different class of service, represents the sort of operation that the industrial control users would be most happy to obtain.

*Presented at the 17th Annual Machine Tool Electrification Forum, sponsored by the Westinghouse Electric Corporation, Pittsburgh, Pa.

Cut costs on hole cutting with . . .

BOREMASTER

Finished holes 1½" to 11-3/4" diameter to a depth of 8" in one rapid operation on your present equipment

with

THE BOREMASTER

Not just another Trepanning Cutter but a real heavy duty tool. Stock removed in one piece eliminating waste.

TIME SAVINGS + MATERIAL SAVINGS = COST SAVINGS

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For easier grinding and mirror finishes in a fraction of the time

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NOW . . . A COMPLETE RANGE OF STAR DUST DIAMOND ABRASIVES FOR EVERY PURPOSE

STAR DUST DIAMOND WHEELS AND HONES

STAR DUST Laboratory graded Pure Diamond Powders

Absolute uniformity resulting from laboratory grading is the reason for the success of STAR DUST Diamond Powders and Compounds . . . And the new line of STAR DUST Diamond Wheels and Hones finds immediate acceptance because for the first time this superior diamond quality is combined with a new bonding formula. That means unequalled performance and wheel life.

Be "Laps Ahead" with STAR DUST! Most sizes available for fast delivery. Write for complete information and new comprehensive catalog C-10

STAR DUST Laboratory graded diamond lapping compounds in 18 gram applicator gun . . . or 5 gram ophthalmic tipped tube.

ACE ABRASIVE LABORATORIES

250 WEST 57TH STREET • NEW YORK 19, N. Y.

the BASCO SEPARATOR *automatically "fans out" Steel Sheets for easier, faster, safer handling!*

Models for any thickness to 3/16"

BASCO lifts the top sheet instantly — automatically raising and separating the next sheet for easy grasping.

• Separates oily sheets • Lifts polished or painted parts without scratching • Eliminates feeding double sheets • Saves gloves—cuts • Handles round, nested or odd shapes • *Permanence of magnetism guaranteed.*

TEST A BASCO IN YOUR PLANT — SOLD ON APPROVAL

Request prices and demonstrations. Distributors Inquiries invited.

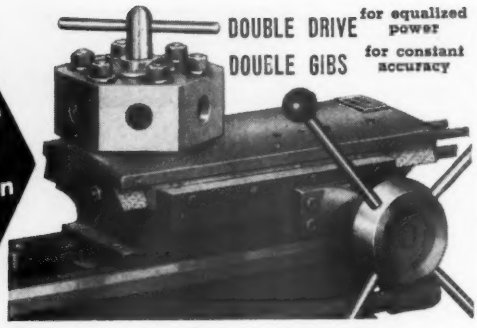
The Basco manufacturing co.

25 Woodside Street • Stamford, Conn.

See it in action: Booth #2338 National Metal Congress.

Enco Self-Indexing HEXTURRET

For Lower Production Costs and Speedier Output



DOUBLE DRIVE for equalized power

DOUBLE GIBS for constant accuracy

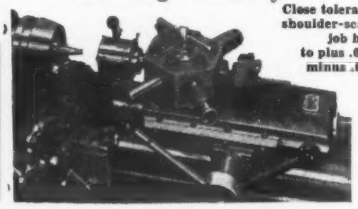
✓ Custom built to fit all lathes from 9" to 18".

✓ Smooth, sensitive control with Pilot wheel drive through twin gears and racks.

✓ All bearing surfaces hand scraped.

✓ All parts of indexing mechanism hardened, assuring accuracy.

Manufacturers of the most complete line of HEXTURRET BED TURRETS, TURRET TOOL POSTS, and TAILSTOCK TURRETS in the country.



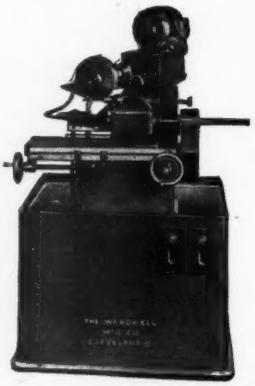
Close tolerance shoulder-screw job held to plus .002; minus .000.

ENCO Manufacturing Co., Dept. 783
4524 W. FULLERTON AVE., CHICAGO 39, ILL.

SEND FOR CATALOG No. 53

Reasonable Deliveries

Work done by 90 FS Automatic Flute Grinder



GROUND FROM SOLID!

Flutes a variety of special size drills, reamers, spiral or straight milling cutters, end mills and saws in gangs up to 7¾" long. No tool shop should be without this machine. It saves costly delay when special drill or reamer is required. Straight or spiral flutes from solid. Indexes automatically, no special skill required. Write for full description on 90 FS Automatic Universal Flute Grinder.

THE WARDWELL MFG. CO.
3155 Fulton Rd., Cleveland 9, Ohio

WARDWELL
Maker of largest line of saw and tool sharpening machines

. . . Awards, from page 99

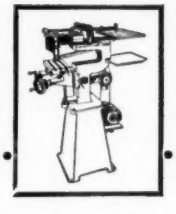
3.62 lost time accidents per million man-hours worked in 1952, and an overall industry severity rate of .350. The National Safety Council figures for all Detroit industry for the year 1952 showed a frequency rate of 4.64 lost time accidents, and a severity rate of .380.

NEXT MONTH—6TH ANNUAL QUALITY CONTROL FEATURE ISSUE

The National Safety Council's Award of Merit, second highest award given to industrial plants was earned by nine other Chrysler Corporation plants, including DeSoto Wyoming, Chrysler Jefferson, Chrysler Kercheval, and the Chrysler Detroit Tank Plant in the Detroit area.

The award of merit was also given to the company's Marysville plant near Port Huron; the Chrysler Airtemp plant at Dayton, Ohio, the Dodge assembly plant at San Leandro, California; the Plymouth assembly plant at Evansville, Indiana, and the corporation's Kokomo, Indiana, plant.

for fast . . .
accurate . . .
engraving . . .
use
"PANTO"



Pictured above is the PREIS-PANTO Model 2D-4 Precision Engraving Machine for use on large metal or plastic panels, signs and name plates; steel stamps and dies or any product requiring precision engraving. Pictured at left is the PREIS Universal work holding fixture designed especially for **quick** holding of work in any engraving machine.

PANTO

Write for 2D-4 and No. 172 illustrated Bulletins and prices.

H. P. PREIS ENGRAVING MACHINE CO.
647 Route 22 Hillside, N. J.

For top production **REMCRAFT**

SEALED BEAM - HEAVY DUTY

WORK LAMPS

are a must!

Model No. 3-38 S.B.
(75 watt sealed beam bulb included)
$13.95
for std. package of 6
19c fed. excise tax on bulb.
Other than std. package, add 15%. F.O.B. factory.

"C" Clamp extra — 95c

- Fully enclosed wiring
- All-brass swivels
- Adjustable in all directions
- Battleship gray finish
- VIBRATION PROOF

Avoid burns with a No. 65 air-ventilated shade as shown. $1.25

"RR" patented swivel.
UL approved.
360° continuous rotation.

If not available at your dealer's, write for catalog.

ROBBOY ELECTRIC MFG. CO.

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Territories for agents and franchises open

Hooray! Double production. Just like Columbia Extra Header Die!

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels—High Speed Steels
Die Steels—Hot Work and Shock Resisting Steels
Carbon Tool Steels.

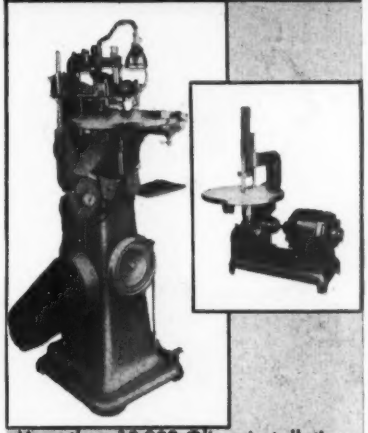
TOOL COLUMBIA STEELS

Get Precision Perfection

Slash Costs with

OLIVER

DIE MAKING MACHINES



More than 10,000 Oliver installations are saving up to 60% in time and labor on jobs where efficiency, accuracy and speed are demanded. Skilled labor is not required for sawing, filing and lapping the proved Oliver Way.

Oliver's 40 years of experience proves without a doubt that it is quicker and cheaper to saw out a piece than to drill and chip it. Oliver Die Makers do all sawing, filing and lapping operations with ease, economy, and speed. Many Oliver Die Making Machines have been in continuous use for more than 25 years. Let Oliver of Adrian save dollars for you in making less-expensive dies, gauges, templates and cams.

OLIVER OF ADRIAN

OLIVER DIE MAKERS
Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

***Write Today For Complete Technical Data on* OLIVER DIE MAKERS**

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
FACE MILL GRINDERS
DIE MAKING MACHINES

See our catalog in Sweet's Directory

OLIVER INSTRUMENT CO.

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DRESEL-BETZ CO.
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ROMULUS TOOL & ENGINEERING COMPANY

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The AMIC Bldg., 21-25 44th Ave., Long Island City 1, N. Y. Jigs, fixtures, gages, dies, precision parts.

CONRAD & MOSER

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DESIGNERS AND BUILDERS
Jigs and Fixtures Special Machines
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Dies, Tools, Jigs, Fixtures, Light Stampings, Special Machinery Manufacturing.

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PRECISION DIES, JIGS & FIXTURES
Quality Stampings
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THE INDUSTRIAL MACHINE CO.

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998 Broadway, Bedford, Ohio, Bedford 2-1234. Tool Makers—Short Run Production Work.

A. P. SCHRANER & CO.

3338 Payne Ave., Cleveland, O., HEnderson 1-8644. External Cylindrical Lapping Machines, Special Machinery, Tools, Dies, Jigs, Fixtures.

TOOLCO COMPANY

Box 172A3, GLENDALE - MILFORD ROAD, SHARONVILLE, OHIO. Ph.: Sycamore 6343. Small Tools, Dies, Jigs, Fixtures and Special Equipment. Parts Production Runs. Catering to Radio Electronics and Instrument fields of Industry.

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For Spotting Wear and Tear

Checking the Spindle and Anvil Surfaces **Checking Calibration Of A Micrometer**

New Checking Set Is Designed for "Mikes"

A "micrometer checking set," designed for checking 1" and 2" micrometers has been added to the DoAll Company's line of gage blocks, gages and gaging accessories. The set includes 3 gage blocks, .2500", .6500" and 1.000". These can be used individually or in combination for checking accuracy of the micrometer screw at various points of its travel. Evidence of wear in the screw can be discovered with such checks.

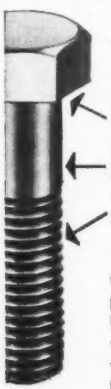
Two optical parallels of fused quartz, which are part of the set, provide an accurate method for checking the condition of the micrometer spindle and anvil faces.

For additional information regarding the micrometer checking set write the DoAll Co., Des Plaines, Ill. **Inform-A-Gram No. D1.**

When so much depends on so little

Don't settle for less than Chicago "*Safety Plus*" High Carbon Heat Treated Cap Screws

- For *complete* hardness from the center all the way out—no soft skin to cause wear or breakage due to fatigue.
- For freedom from scale — cleaner to handle — give a tighter thread fit — have smoother bodies.
- For extra safety — better appearance — ALL at no increase in cost to you.



You get these advantages with "Chicago" Heat-Treated Cap Screws.

Corners stay sharp . . . provide positive non-slip wrench grip . . . No decarburized surface.

Bodies wear longer . . . nominal diameter remains to size . . . No decarburized surface.

Threads without nick . . . hold tighter in engagement . . . No decarburized surface.

Your Service-Conscious Industrial Supply Distributor carries a complete stock of our products. Ask him for samples of "Chicago" Heat-Treated Cap Screws. His familiarity with your local field conditions enables him to fill your supply needs promptly and correctly. Ask for "Chicago" and get better service.

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FORD regrinding service adds tool life, reduces tool costs!

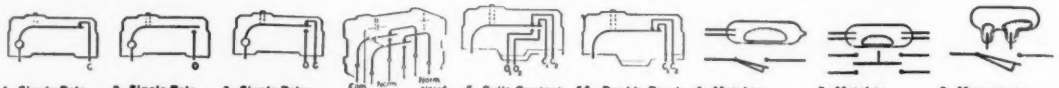
M. A. FORD MFG. CO., INC.

Pioneers in rotary tools for more than 30 years

DAVENPORT 1, IOWA

Table I—Mechanical and Electrica l Characteristics of Typical Switches

Switch Type (Cat. Number)	Size, In.	Probable Mechanical Life (Operations)	Contact Arrangement (See Notes)	Operating Force, oz.	Differential Travel, In.	Alternating Current Ratings: Voltage, volts a-c	Inrush Current, amp.	Steady State Current, amp.	Motor Load, HP
Conventional Case Highest Precision (BZ-R, BZ-2R, Micro)	1-15/16 x 27/32 x 11/16	20,000,000	1, 2, 3	7 to 13	0.0002 to 0.002	440	30[9]	15	1/4[11]
Conventional Case Heavy Duty (BA-2R, Micro)	1-15/16 x 27/32 x 11/16	10,000,000	1, 2, 3	11 to 22	0.002 to 0.0075	440	75	20	3/4 at 115V 1 1/2 at 230V
Hermetically Sealed (1HS1, Micro)	1-15/16 x 1-1/8 x 11/16	2,000,000	3	10 to 22	0.020 max.	125 (30V d-c)	— (70)	1 (25)	
Magnetic Blowout (MT-4R, Micro)	1-15/16 x 7/8 x 11/16	800,000	3	10 to 16	0.005 max.	(125V d-c)	(30)[12]	(10)[13]	(1/2 at 115V d-c)
Subminiature (1SM1, Micro)	25/32 x 1/2 x 1/4	44,000	3	7 max.	0.008 max.	250	12	5	1/8 at 230V
Split Contact (BZ-3YT, Micro)	1-15/16 x 1-1/16 x 11/16	300,000	6	16 to 26	0.001 to 0.004	250	15	5	1/8 at 115V 1/4 at 230V
Medium Size (V3-1, Micro)	1-3/8 x 1 x 13/32	50,000	3	6 to 14	0.006 to 0.016	250	35	10	1/3 at 115V 3/4 at 230V
Rotary Actuated Sensitive (V4-14, Micro)	1-1/16 x 1 3/64 x 3/4	4,000,000	1, 2, 3	4 gram-in. max.	12° max.	250	—	5	
Double Pole Double Throw (DT-2R-A7, Micro)	1-15/16 x 1 1/4 x 11/16	300,000	4	20 max.	0.035 to 0.055	250	30	10	1/4 at 115V 3/4 at 230V
Skeleton (SK-3, Micro)	2-1/8 x 7/16 x 7/16	10,000,000	1, 2, 3	3 to 8	0.008 to 0.030	250	35	5	1/4 at 115V 3/4 at 230V
Mercury Switch, Small (AS408D1, Honeywell)	1-7/16 x 11/32		6		12°	250	—	1	
Mercury Switch Medium S.T. (AS454A1, Honeywell)	2 7/16 x 37/64	varies with care given loads	6	varies with application	5°	250	45	10	1/2
Mercury Switch Medium D.T. (AS628C1, Honeywell)	3 1/8 x 17/32		7		1°	250	13	5	1/12
Mercury Switch, Large (AS482A1, Honeywell)	2 3/16 x 41/64		8		6.5°	250	144	45	3



1. Single Pole, Normally Closed. 2. Single Pole, Normally Open. 3. Single Pole, Double Throw. 4. Double Pole, Double Throw. 5. Split Contact. 5A. Double Break. 6. Metal to Mercury, Single Throw. 7. Metal to Mercury, Double Throw. 8. Mercury to Mercury, Single Throw.

9. 30A for N.C. contact, 15A N.O. contact.
10. 5A for N.C. contact, 2.5A N.O. contact.
11. 1/4 HP N. C. contact, 1/8 HP N. O. Contact.
12. Resistance load ratings.
13. Current rating dependent on voltage.

Courtesy of Instrumentation

. . . Precision Switches, from page 66

General purpose switches are intended primarily for a-c applications, and difficulty with prompt interruption of a-c loads is unknown under ground level operating conditions. Temperature rise becomes a factor only when caused by arcing on sustained high-speed operation with heavy electrical load.

Solenoids, relays, coils, motors, and other electro-magnetic devices permit high current inrush on closure of the circuit. This may result in excessive and uneven contact wear and even permanent welding of the switch contacts if they are not suited to such service.

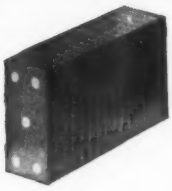
A-c motors have starting and stalled current demands ranging from 5 to 10 times the full load demand. If a switch must be used to start the motor frequently, use relays with motors larger than 1/6 hp. If the switch acts only as a safety or infrequently used limit switch to stop the motor, relays will be needed only for motors larger than 1/2 hp. An overload cut-off device on the motor will help to avoid trouble.

Relays, coils, and particularly solenoids have impedance values that vary according to the position of the moving core or plunger. The load demand is highest when the core plunger is farthest out of the coil. With the core or plunger in this position, energizing the coil will give a heavy inrush of current which will diminish as the core or plunger is drawn into the coil. In some solenoids, the inrush current may be 10 times the current drawn when the plunger is seated. The switch selected for control of such devices should be adequate for the maximum inrush current value.

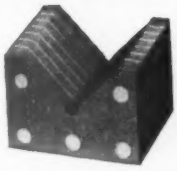
General purpose switches are subject to certain limitations when used in d-c applications. On many such applications, condensor and resistor combinations may be required for adequate performance. Rectifiers may also be used to assist in arc-interruption. D-c motor running loads usually can be handled without such arc-controlling circuits. D-c loads up to 10 amps at 115 v may be handled satisfactorily by switches that incorporate permanent magnets for blowout of the arc. It is sound practice to consult the switch manufacturer when d-c applications are required.

To Be Continued

MAGNETIC CHUCK PARALLELS and V BLOCKS



No.	Size	Matched Pair	No.	Size	Matched Pair
IP2	1x2x2	$16.50	IV2	1¾x2½x2	$22.50
IP3	1x2x3	19.50	IV3	1¾x2½x3	33.75
IP4	1x2x4	22.50	IV4	1¾x2½x4	45.00



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- Five silicon bronze dowels welded to end plates.
- Ground parallel and square.
- "V" in V block ground parallel to base and centered.

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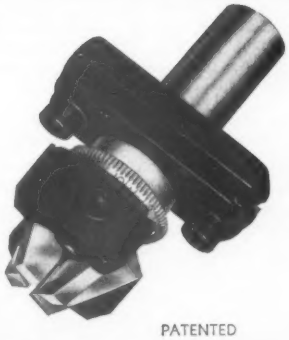

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5/32	1.65	21/64	2.50	1/2	3.60
11/64	1.65	11/32	2.50	17/32	4.00
3/16	1.65	23/64	2.75	9/16	4.25
13/64	1.80	3/8	2.75	19/32	4.50
7/32	1.80	25/64	3.05	5/8	4.80
15/64	1.95	13/32	3.05	21/32	5.20
1/4	1.95	27/64	3.30	11/16	5.60
17/64	2.05	7/16	3.30	23/32	6.00
9/32	2.05	29/64	3.60	3/4	6.50

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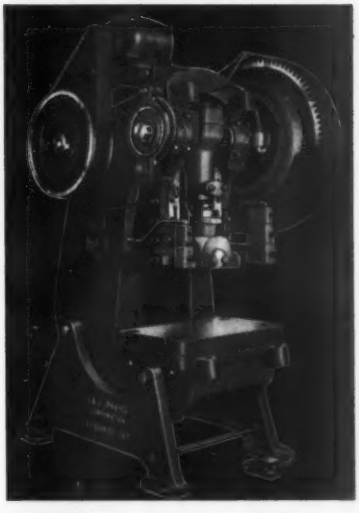

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This dependable combination permits maximum practical speeds plus greater safety and shock-free, full-power operation. Selective controls include inching, single stroke and continuous running. The L & J Air-Release Spring-Set Brake sets automatically if air pressure fails.

It will pay you to find out the advantages this 80 ton press has to offer. Also, 11 other back geared and plain flywheel models starting at 6 tons.

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Triple-Chip METHOD
REMEMBER—IT'S THE COST PER CUT THAT COUNTS!
ALL 3:

Scenes from NTDMA's Film Premiere

The first motion picture ever produced that deals exclusively with the contract tool and die industry and its vital role in the American economy will be premiered by the National Tool and Die Manufacturers Association in New York City on September 15.

The twenty-minute full color and sound film, entitled "Tool and Die Making—Keystone of Mass Production," was produced for the NTDMA by Farrell & Gage Films, Inc., of New York. Sequences were filmed at tool and die shops and leading production plants in the East and Mid-West.

"The toolmaker uses a variety of instruments and tools for accurate measurement—the most important factor in tooling for all industry. Measurements as fine as one ten-thousandth of an inch are part of his daily routine."

Designed to educate industry, government and the general public on nature and scope of contract tool and die making, the film will also be used by the association and its 800 member shops to encourage young men with mechanical aptitude to become tool and die apprentices.

"Operation of the basic machinery of the craft, blueprint reading, shop mathematics and shop theory are but a few of the skills a tool and die maker must master."

Production procedures on such diverse items as automobile crankshafts and zippers are shown, together with the toolmaking practices upon which such production depend. The purpose of jigs and fixtures in

. . . Continued on page 176

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Recognized by various Federal Agencies
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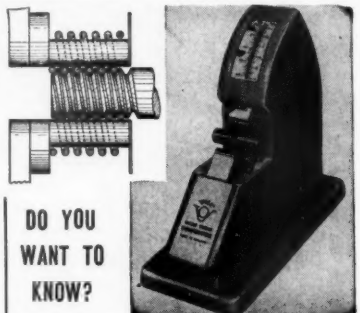

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SAVES TIME AND MONEY—no more blocking and shimming odd shaped pieces for tool room machining.

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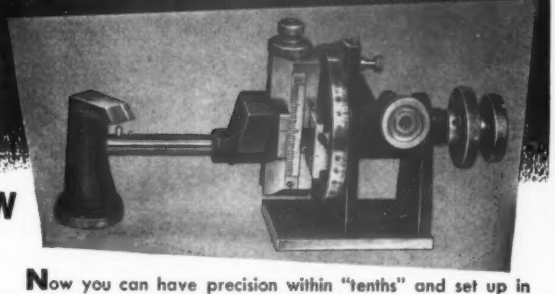

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Now you can have precision within "tenths" and set up in *one-fourth* the time. Tangi-Matic has a direct-reading micrometer *built in*, eliminating "mikes", height gages, Jo Blocks *and errors*. Even novice operators obtain extreme accuracy. Tangi-Matic dresses any concave radius down to .032", full 180° with equipment we give you. Set-ups can now be made without removing dresser from your grinder chuck.

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Results of normal heat-treating often require hours of expensive polishing to remove scale, pits and decarburization, etc. This can be eliminated.

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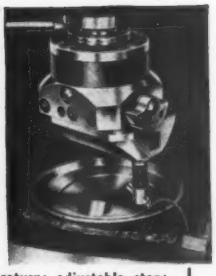

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CONCENTRIC TAPER on lower half of each gage fits holes 0.0012" smaller than standard letter, fraction, and number size drill holes. Makes insertion easier. Permits gaging of odd-size holes and slots.

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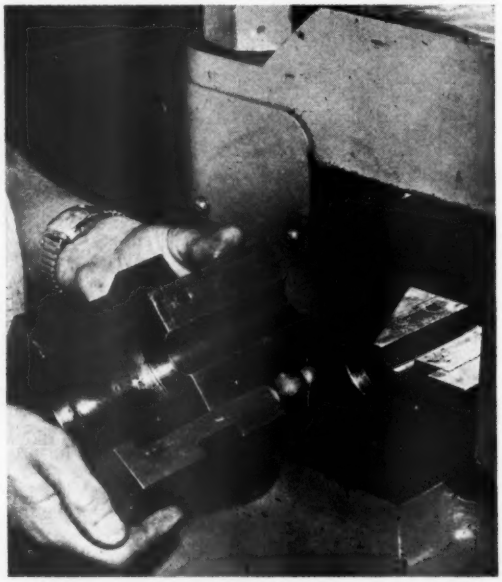
Interchangeable Inserts for Master Clamp Blocks

A master clamp block with interchangeable inserts, devised by Elgene Pearce, leadman in the tool and die department, has resulted in savings of man hours and material at TEMCO Aircraft Corporation, Dallas, Texas.

The adjustable block, designed for use with a Vaill #7 tube end forming machine, substitutes



the inserts for additional blocks which normally would be required to hold different sized tubes.

Pearce's master block duplicates the standard clamp block in all external dimensions except length. Here an extra ½-inch is added to provide a rim or shoulder against which the inserts fit securely.

Internally the Pearce block is bored to a diameter of 3 inches for a length equivalent to that of the standard block. The extra ½-inch of length is bored to a 2½-inch diameter which gives the shoulder a height of ½-inch.

Each insert is made in two semi-circular sections which fit together, narrowing the master block bore to fit various tube sizes. Two allen bolts hold inserts and master block together during handling, and pressure exer'ed in tube processing forces inserts firmly against the master block.

Savings resulting from the master block-insert combination increase directly with the number of different sized tubes being processed, according to TEMCO officials. They point out that the first set consisting of one master block and nine inserts designed for tube sizes ranging from ½-inch to 2 inches saved an estimated 315 man hours in fabrication time alone, and that far greater savings will be achieved as additional sets are required.

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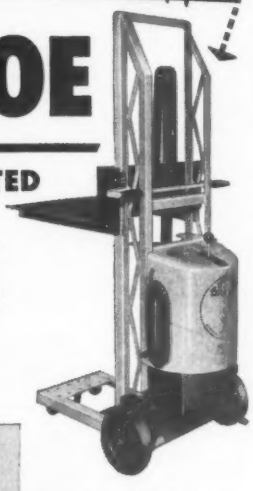

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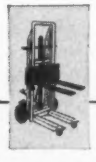

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$83.50 EACH F.O.B. your plant

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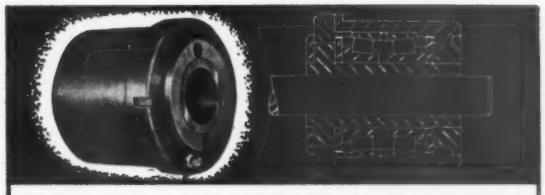

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* Protects against thrust loads as well as radial
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Gentlemen: Please send me your illustrated brochures which give complete prices and specifications on Procunier High Speed Tapping Heads and Machines.

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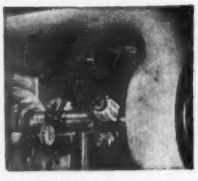
TRADE MARK

FOR MOUNTING TEST INDICATORS INSTANTLY TO FLAT OR DOWN TO ¾" ROUND WITH PULL OF 65 LBS.



Model 100 being used to align fixture in production mill.

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NEW! 3-step universal rod for all indicators. Sizes 5/32", ¼" and 5/16" diameters.

NEW! Ball-swivel and stem of non-magnetic material.

NEW! Sure-grip non-breakable tenite plastic case 1⅛" wide, 1⅞"long and 1½" high.

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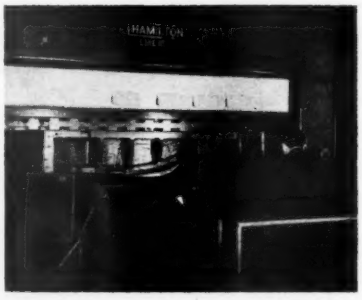
A MODERN GUIDE FOR A MODERN SAW

. . . NTDMA, from page 172

manufacturing is demonstrated and described in simple terms, and the toolmaker's constant emphasis on accuracy is dramatically portrayed.

To demonstrate the merging of craftsmanship and precision machinery that is the essence of the contract tool and die industry, the film follows the progress of an apprentice through the 8,000-hour course leading to journeyman status. It shows the apprentice "learning by doing" —operating various machines, studying blueprint reading, shop mathematics and shop theory, and mastering the other techniques required in the complex art of tool and die making. The narration points out



"Sometimes a complicated die like this costs more than the press itself. Often tooling takes as much time to build as the machine tools with which it is to be used."

that toolmaker training is equivalent to a college degree—with the added advantage of earning while learning—and that the journeyman tool and die maker holds a position that commands both respect and excellent pay.

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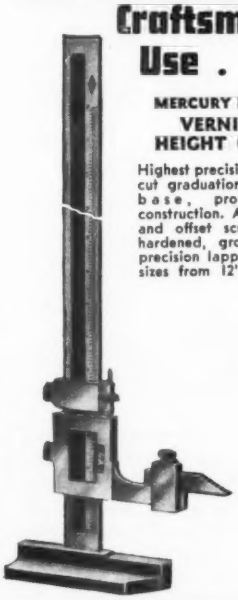

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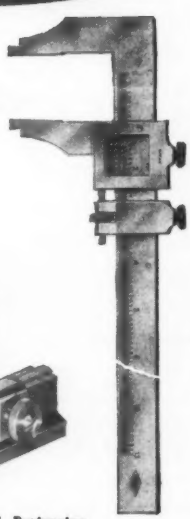

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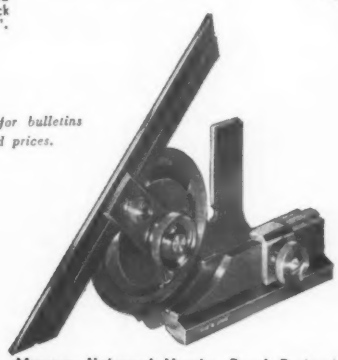

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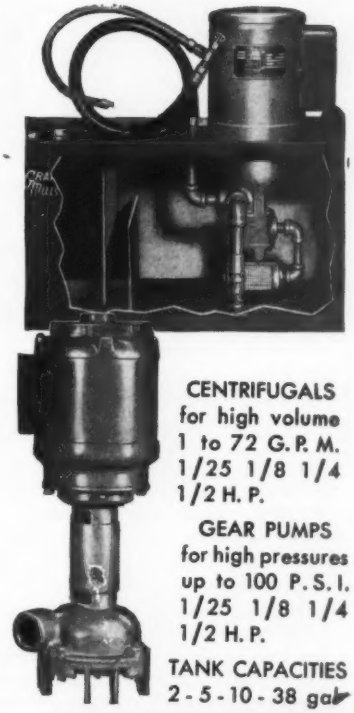

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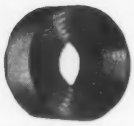
from coil stock...



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for flat blanks...

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- Material and workmanship fully guaranteed.

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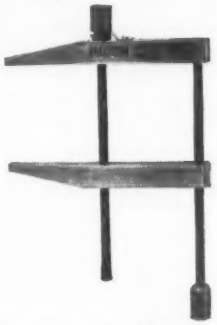

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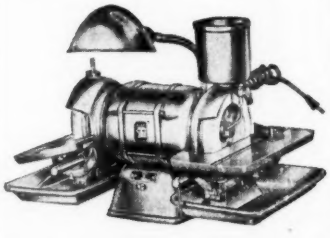

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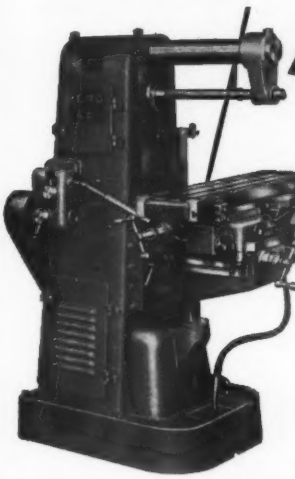

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Equipped with anti-friction bearings.

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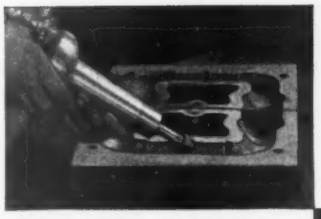

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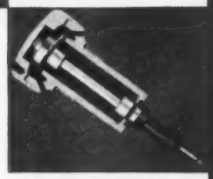

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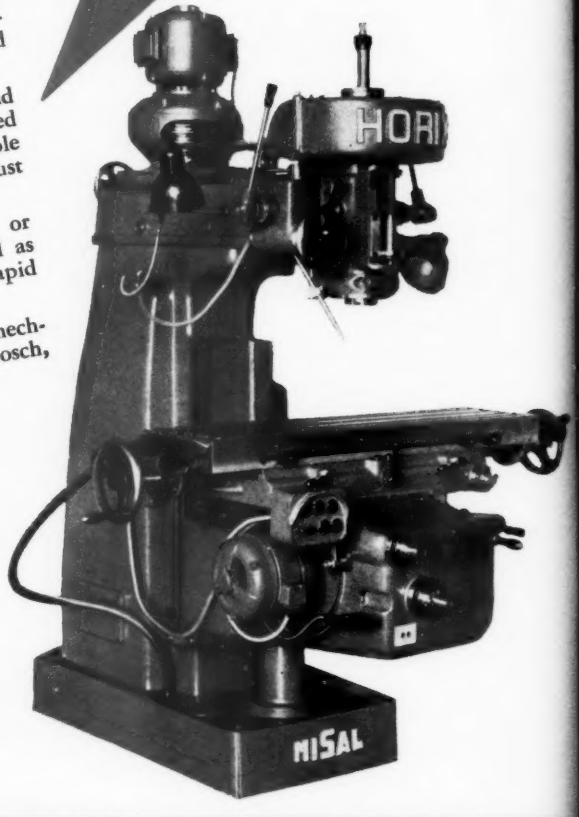

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